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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

The Premier's Work in London.

ON his return from his mission to Great Britain, the Premier, Hon. W. Forgan Smith, LL.D., met with a rousing reception at the South Brisbane railway station from an immense assemblage of citizens, which was representative of every section of the community. "I can assure you that I am very glad to be back here to co-operate with you all in the work of making this great State a greater State still," remarked the Premier, who then went on to say that his business in London had been strenuous work. The Federal Treasurer (Mr. Casey), the High Commissioner (Mr. Bruce), and himself, assisted by the Agent-General for Queensland (Mr. Pike) and Mr. Townsend, of the Customs Department, made a strong combination in the Sugar Conference. Australia emerged with a quota of 400,000 long tons, together with a proportionate increase each year during the agreement on any increased consumption in the free market. In addition, duties had been stabilised for five years. Queensland sugar would have a preference in the British market equivalent to 4s. 6d. a hundred-weight in Australian currency. If the British Government contemplated any alteration at the end of the five years it was pledged to give eighteen months' notice. The agreement would be of advantage to the sugar industry, and would stabilise sugar growing and allied interests in Queensland. The industry now could look forward with greater contentment, and would be enabled to view its problems in the light of known facts.

Great Britain before the war was dependent entirely on imported sugar. To-day it supplied 25 per cent. of its requirements under a bounty higher than the value of sugar on the world market. That was done as a matter of national policy. It was something for the Australian critics of the sugar industry to ponder over. Other countries also had increased their areas under beet for sugar production. Russia, for example, estimated that this year its output would be 3,000,000 tons. If this figure, given by the Russian representative at the conference, was realised, Russia would have become the largest sugar producing country in the world. A few years ago Russia did not export sugar at all. He mentioned these things to show the need for rationalisation in the sugar industry. There had been no curtailment in any way in the agreement. All would agree that the best had been done by the Australian delegation in the circumstances.

The Premier said that Mr. Casey and he had co-operated on all matters raised at the conference. There was no disagreement whatever. The result was due very largely to that co-operation. It demonstrated the advantage of the closest co-operation between the Commonwealth and the State or States concerned in negotiating any trade treaties.

All the money necessary was being found in every leading country of Europe for the armament programme, but when proposals were put forward for the conservation of human life there was great disagreement among the financial experts and economists.

"If money can be found for armaments, why is it not possible to find money for the development of a great country like Australia?" asked Mr. Forgan Smith, amid applause.

"I assert that there is no one within reach of my voice who believes in war. We want to live in amity and peace with our fellow men. The problem of civilisation is to give food, clothing and shelter for all industrious people and sufficient leisure to develop those treasures of the mind that lie latent in us all. It is along those lines that progress and development can take place whereby we can add our quota to the upward trend of civilisation.

"It is pleasing to note that Great Britain is peace minded," the Premier added. "There is no desire on the part of anyone of importance to embroil the world in another tragedy. The British Commonwealth of Nations in my opinion is the strongest influence for peace and civilisation existing in the world to-day.

"The development of peacemindedness is an essential. It is not a matter so much for a Government; governments necessarily reflect the attitude of the people, but if individuals themselves are peaceminded and support an economic and sociological policy which brings about that end then you too are contributing to the work of civilisation. . . . It behoves all people to keep their heads and understand the conditions in which they live and do their work in their allotted sphere here in Australia.

"In my travels I take particular notice of the conditions under which the people live; all the people I am interested in, all the people engaged in useful service, whether working by hand or brain or both, and I say definitely there is no country I have yet visited where better conditions obtained than in Australia," continued the Premier.

"Those things which have brought this about are not done by accident. Money does not grow annually like wattle on a bush. Those things we enjoy at present are the fruit of the work that has been done to date, but none of us can live on the past or on what we have done in the past.

"Our work is one of gradual progression and climbing ever upward towards our ideal goal so that it is our duty to preserve the measure of freedom we now enjoy and contribute our part in our day and generation to make this a better and brighter country for all our people."

Science in Dairying.

OPENING the second dairy science school for butter factory employees, which will continue in session in the dairy science laboratory, Department of Agriculture and Stock, during July, the Minister, Hon. Frank W. Bulcock, said the real basis of the future prosperity and success of the dairying industry in Australia was the degree to which appeal was made to the palate of the consumer, plus the degree to which, by technical operations and proper supervision, economic loss could be eliminated. Economic loss could largely be overcome by technical application and research. Without that technical knowledge the dairy industry could not expand to the extent that its importance demanded. The crux of the whole position was in the factory. With properly trained technical staffs in the industry they could reasonably hope to make the progress they should, if they had proper and unrestricted access to the overseas market. But unless Australia continually improved dairy production, and the levels and general gradings of dairy exports, she would be confronted not with an increasing but with a declining market.

Dairy operatives must be competent in every section and able to supply a product comparable with that shipped from other countries. There was a general recognition of the value of the technician in agriculture, and this, perhaps, applied particularly to dairy production. In the final analysis, quality determined access to the markets of Britain, and it was essential that those engaged in the export of dairy products should have a thorough understanding of the economics of the industry. Mr. Bulcock remarked further that he was sometimes apprehensive about the future of our export trade, but with the knowledge that technical excellence could be attained in every factory operation that feeling of anxiety was soon dispelled.

Red Spider.

ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist and Director of Research.

THE red spider* is a species of mite frequently found on a wide range of economic and weed host plants, banana, bean, cotton, cucumber, deciduous fruit, grape vine, melon, papaw, pea, pumpkin, tomato and strawberry being among the cultivated plants subject to severe infestation. This species must not be confused with the red mite, a common but relatively unimportant pest of deciduous fruit. One important distinguishing feature is the fact that the red spider is a web-spinning species, whereas the red mite does not possess the faculty of producing the fine silken threads so characteristic of a red spider outbreak. The species may also be separated in the laboratory by the relative lengths of the four pairs of legs in the adults, the front pair of legs in the red mite being much longer than the other pairs, whereas in the red spider such a disparity does not exist.

Life History and Habits.

The round, somewhat transparent, eggs, which cannot be seen without the use of a hand lens, are laid among the silken threads on the under sides of the leaves of selected host plants, each adult female being capable of laying from sixty to seventy eggs at the rate of two to six a day during her adult life of two weeks. These eggs are laid irregularly on the infested foliage, and hatch after an incubation period of four or five days. The mites on hatching are six-legged, colourless and rather transparent, but after feeding they acquire a greenish-yellow tinge. The female mites vary very appreciably in colour, yellow, green and brick-red individuals occurring, the otherwise uniform colour being broken by the presence of two dark spots, one on each side of the body, the occurrence of these spots being responsible for the designation of two-spotted mite which is sometimes applied to this species. The adult female possesses four pairs of legs, a short, rounded body, and mouth parts that enable it to suck the sap of the plant on which it is feeding, the length of the adult being about one-sixtieth of an inch. The adult male is somewhat smaller than the adult female, is less rounded, and is rather salmon-coloured, the darker spots being less conspicuous than in the female. During the height of summer the life cycle is completed in less than a fortnight.

As a result of the feeding of this mite small, pale spots appear on the infested foliage, which thereby acquires a mottled and unhealthy appearance. As the infestation becomes more intense the whole leaf acquires a light, unhealthy colour and withers, reddish-brown blotches not infrequently appearing, premature leaf fall and consequent weakening of the plant being the inevitable outcome of severe infestation. The under surface of infested leaves often has the appearance of having been dusted with a fine white powder, this impression being conveyed by the presence of large numbers of cast skins.

The red spider reaches its maximum abundance during warm, dry weather; heavy rain and a fall in temperature lead to a rapid decline in its numbers.

---

* *Tetranychus telarius L.*

Control.

Spraying infested plants with lime sulphur at a strength appropriate to the plant to be treated and to the prevailing weather conditions produces satisfactory results against this pest. Lime sulphur sprays are unsuitable for some of the host plants of the red spider, and in such cases dusting with sulphur is sometimes employed. Reports on the results of sulphur dusting are, however, somewhat conflicting. The control of this pest should be undertaken at an early stage in the infestation, and whether spraying or dusting is employed every effort should be made to cover the under surface of the foliage, which is, of course, the seat of infestation. Furthermore, treatment should be carried out in such a manner as to ensure that no injurious residues occur on the marketed product. Spraying with a strong jet of water is sometimes recommended as suitable for relieving a few sturdy garden plants from red spider attack.

The fact that red spider breeds on quite a number of weeds suggests another line of control, namely, the elimination in so far as is practicable of whatever weeds are known to harbour the pest. Such weeds growing among or in the vicinity of the cultivated plants, or on or near the ground to be planted, are best destroyed by cultivation.

CARE OF SICK ANIMALS.

Stockowners are frequently required to diagnose and treat sick animals and, from their constant observation of stock in good health, are quick to notice any abnormal behaviour due to sickness. A knowledge of the normal temperatures, pulse and respiration rates of various animals is most valuable in arriving at a correct diagnosis of the trouble. The temperature of all young animals is somewhat higher than that of older animals, and various influences—such as periods of oestrum, time of day, external temperature, and so on—may alter the temperature of the mature animal. The temperatures of healthy farm animals are:—horse, 99.5—101 degrees; cow, 100—101 degrees; sheep, 103 degrees; pig, 102.5 degrees.

The temperature of an animal is usually measured in the rectum, and a self-registering thermometer such as is commonly used in human practice may be used. Care should be taken to see that the column of mercury is shaken down. A small quantity of vaseline smeared on the bulb as a lubricant to assist the passage of the instrument is desirable, and it is inserted with a circular motion between the fingers, forward in a line with the backbone, and allowed to remain for a few minutes before it is withdrawn carefully and the reading taken. If the temperature of an animal is found to be about 2.5 degrees above normal it is said to have a low fever, if it reaches the vicinity of 4 degrees above normal a moderate fever is indicated; and, if in the neighbourhood of 6 degrees above normal, it has a high fever.

In some diseases, such as tetanus and sunstroke, the temperature may be as much as 10 degrees above normal. Having decided by use of the thermometer whether the sickness is of a febrile or nonfebrile nature treatment and nursing must be considered.

Good nursing is of the utmost importance. The patient should be provided with a soft bed, shade from sun, wind, or rain, and a rug in cold weather. A supply of water and green feed should also be provided if possible.

Medicines are usually administered by the mouth in the form of a drench, and it is necessary to be careful and patient in the use of this method. The head of the animal should not be raised above a horizontal position, and only small quantities of the drench poured into the mouth at a time, allowing time for swallowing. Pinching the throat to induce swallowing should not be practised, and the head should be lowered if the patient commences to cough.—W. DIXON, Inspector of Stock.

Sown Pastures and their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Agrostologist.

(PART I.)

THE NEED FOR SOWN PASTURES.

ECONOMIC livestock production is dependent upon productive permanent pasture, which is the cheapest form of stock food. Whilst in Queensland much of the native pasture of the open downs, and of the more open types of forest country, has always been of good grazing value, the denser eucalypt forests, the rain forests (or "scrubs"), and the brigalow "scrubs," in their natural state, carry little or no grass and are practically useless for grazing purposes. The rapid conversion of heavily-timbered country into grazing land involves the sowing down of pastures. Since the latter part of the last century the timber of hundreds of thousands of acres of country has been replaced by artificially sown pastures, and the possibilities of expansion in this direction are enormous. The replacement of unproductive native pastures by superior pasture types also calls for artificial seeding.

In another direction, too, there is scope for the sowing down of pastures of a semi-permanent type. Continuous cultivation of cropped lands assuredly causes a very serious depletion of soil fertility, and also produces adverse changes in soil structure. These retrograde changes can best be arrested, and the soil more or less restored to its original condition, by alternating crop production and the grazing of semi-permanent pastures. The beneficial effects of including semi-permanent pasture in a cropping system are intensified if the pasture consists wholly or in part of leguminous plants such as lucerne and clovers.

Yet another function for which sown pastures may and should be more widely utilised is the prevention of soil erosion and soil drift.

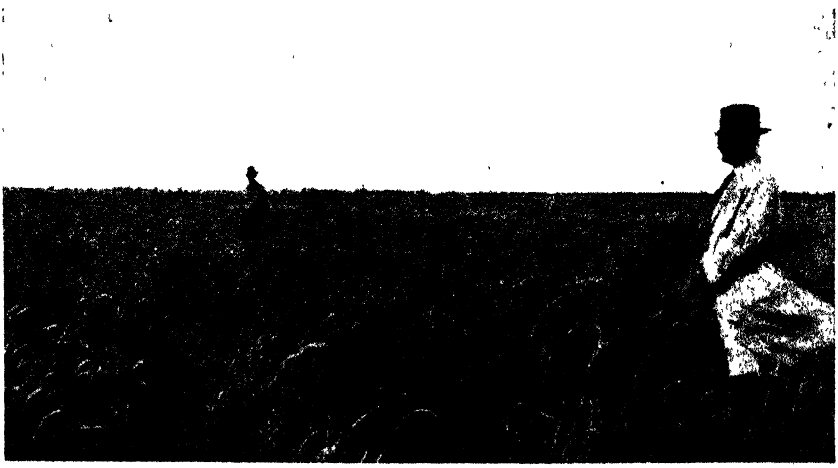

Plate 1.

Bull Mitchell grass (*Astrebla squarrosa*) on a mixed Mitchell grass plain in Western Queensland.

[*Photo., W. D. Francis.*

Plate 2.

Typical grassland forest, South Burnett.

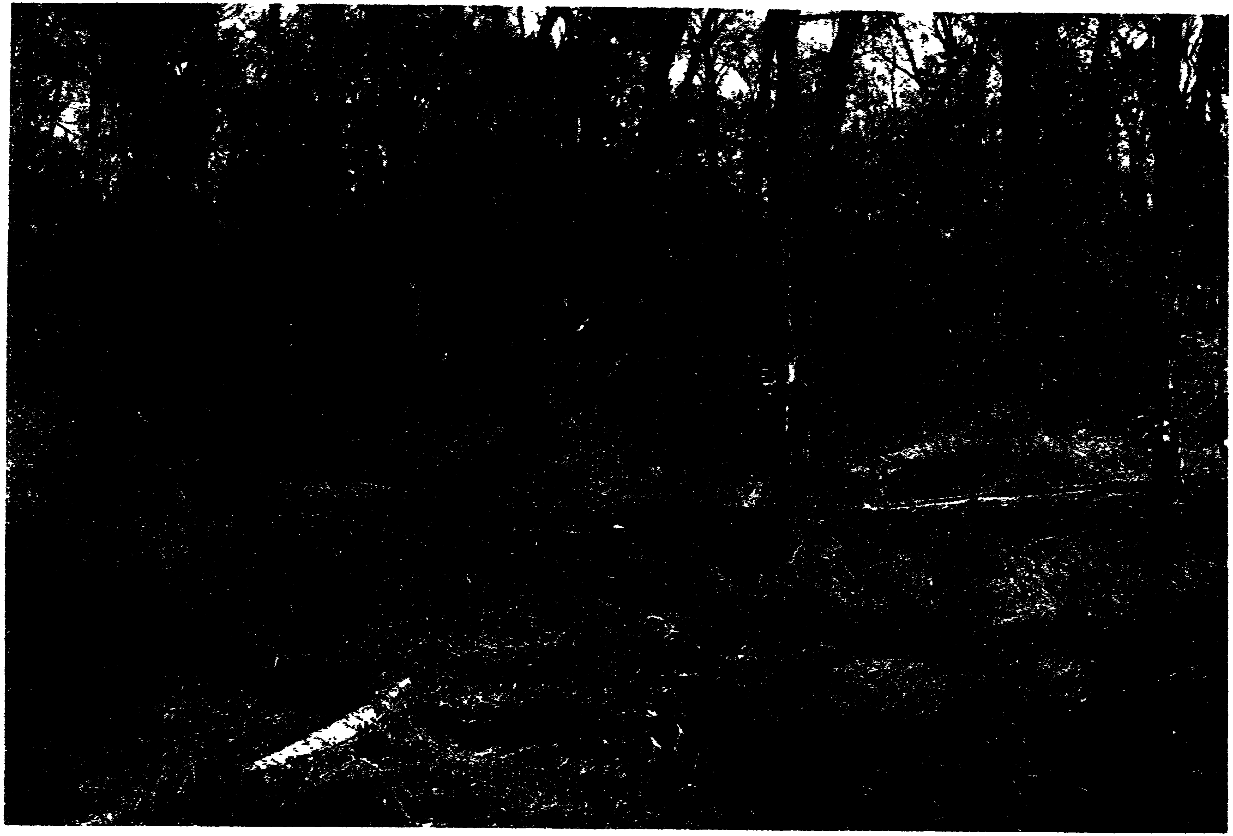

Plate 3.

Brigalow and Belah scrub carrying a heavy coating of native grasses eighteen months after ringbarking.

[*Photo., J. A. Lunn.*

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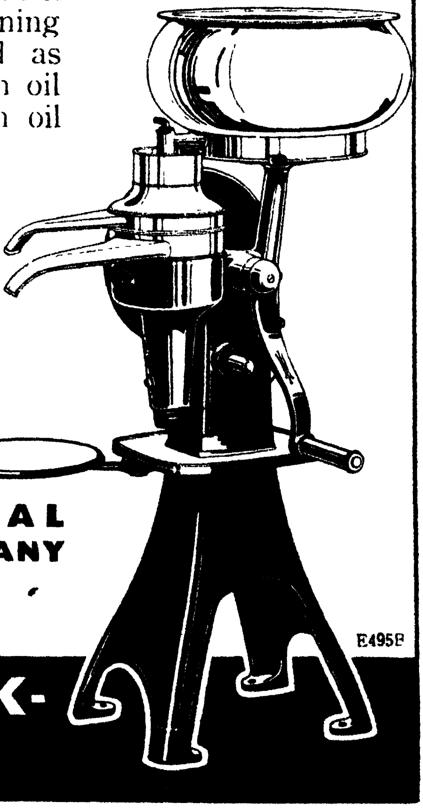

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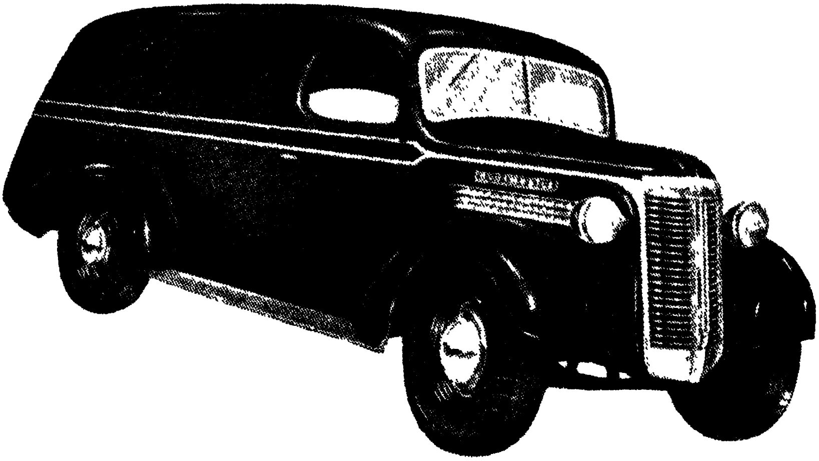

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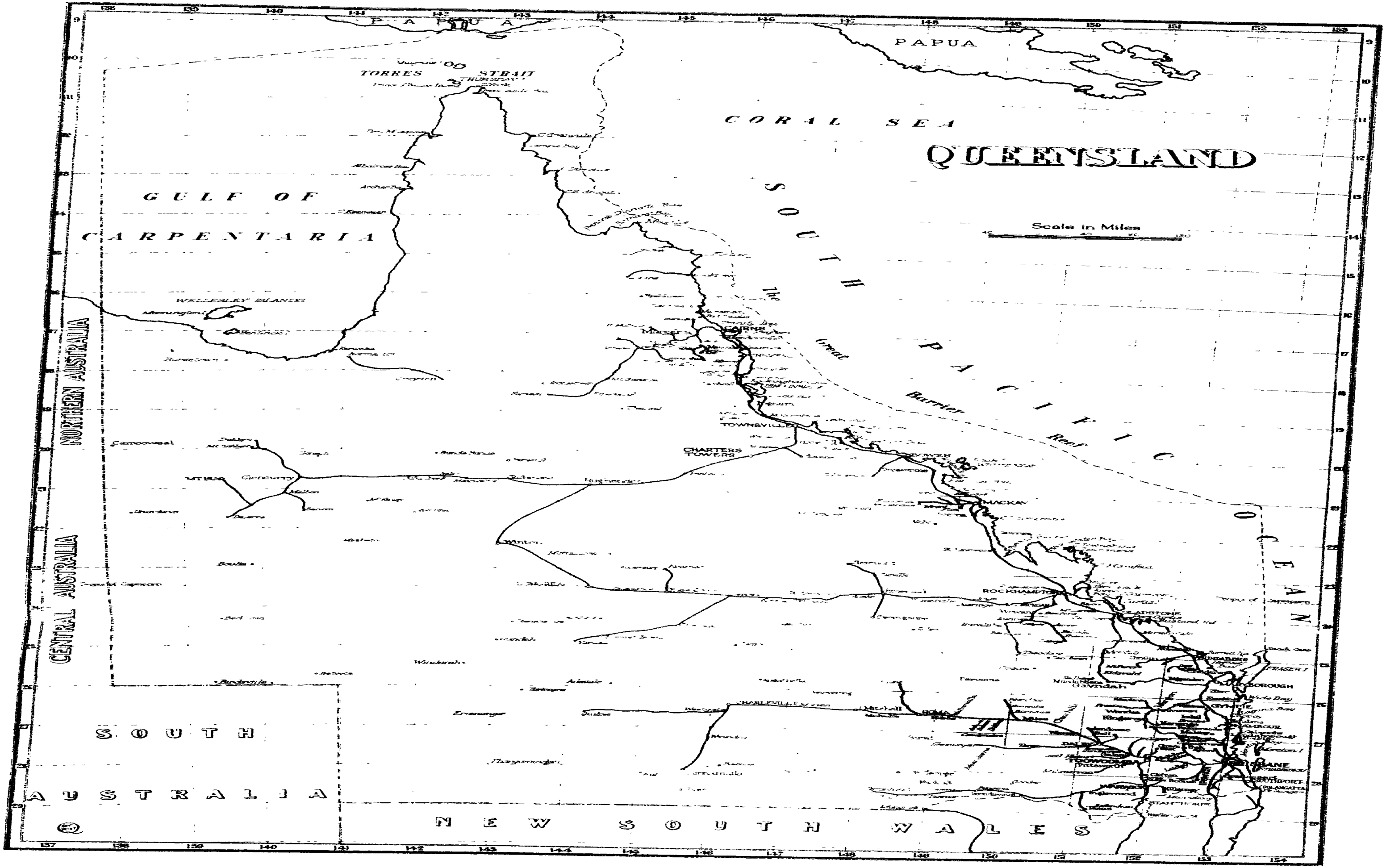

MAP SHOWING THE MAIN AREAS (MARKED IN RED) IN WHICH SOWN PASTURES ARE UTILISED

In addition to their usefulness in the above respects,—viz., as cheap food for livestock, as a factor in maintaining agricultural soils in good condition, and as a soil conserving agency—sown pastures are valuable for reclaiming certain types of poor lands, for surfacing playing fields, etc., and for a variety of other purposes.

PASTURE TYPES IN QUEENSLAND.

The major pasture areas of Queensland are embraced in the following classification:—

I. Native pastures, consisting for the most part of Mitchell grass and blue grass downs (occupying large areas in Western Queensland) and tropical forest grassland extending from Cape York Peninsula to the southern border of the State. (Plates 1 and 2.)

II. Semi-natural pastures of native species self-established in forest country after clearing, ringbarking, or poisoning of the standing timber has been effected. (Plate 3.)

III. Artificially sown pastures, laid down by landholders.

Native pastures occupy a total area of about 300 million acres in Queensland. Less than one million acres is under artificially sown pastures, and of this total the area carrying permanent winter pastures is but a few hundred acres. The grasses sown for summer grazing purposes are (for the most part) not native to Australia, but are introductions from countries which experience climatic and soil conditions resembling those in parts of Queensland that are devoted to dairying and other semi-intensive grazing industries.

Although they represent only a small proportion of the State's pastures, sown pastures are of considerable importance, particularly to the dairying industry. Most of Queensland's beef cattle and sheep are raised on the immense area of native pastures; but, with the anticipated expansion of the chilled beef and fat lamb export industries, which will demand a continuity of supply of animals in "full bloom," the area under sown pastures is likely to be greatly extended at the expense of native pasture, crops, or forest.

The areas of the State in which unirrigated sown pastures are used are virtually coincident with the areas indicated on the accompanying map (Plate 4) as being devoted to agriculture and dairying, although it is probable that the area could be extended in many directions, particularly in the Maranoa district.

KINDS OF SOWN PASTURES.

In the agricultural districts and areas adjacent thereto the types of sown pastures which can be utilised are as follows:—

I. Permanent and semi-permanent pastures, composed of perennial and/or self-regenerating annual species. They are expected to persist for a number of years, and may be intended either for spring-summer-autumn grazing (e.g., paspalum and Rhodes grass pastures), or for autumn-winter-spring grazing (e.g., Phalaris and Wimmera ryegrass pastures).

II. Temporary pastures of annual species, sown to tide animals over periods of stress in permanent pastures or for soil improvement purposes. Such temporary pastures can be so arranged as to take the place entirely, or nearly so, of permanent sown pastures.

Since there is practically no regularly irrigated pasture in Queensland, the types of sown pasture which succeed in any particular district are determined largely by climatic conditions within that district; but, as the rainfall is everywhere chiefly of summer incidence and the winters not unduly cold, permanent summer-growing pastures predominate and usually suffice to maintain production from late spring until early autumn. The usefulness of permanent winter-growing pastures is strictly limited; first, by the paucity and unreliability of the winter rainfall, and, secondly, by the hot conditions of summer.

Temporary pastures are more commonly used to provide winter and early spring grazing than they are for summer grazing, though, in some predominantly agricultural districts, summer-growing annuals, such as Sudan grass, are largely used as an alternative to permanent pasture.

A large proportion of the artificially sown pastures established in Queensland is found in the coastal areas originally covered by rainforest. The rain-forest areas correspond with rich basaltic and alluvial soils, and on such soils, in areas with an average rainfall of over 40 inches per annum, such as the Atherton Tableland and those portions of the coastal fringe on which dairying is conducted, a South American native, *Paspalum dilatatum*, finds conditions suitable to its vigorous development. It should be remarked, however, that the hottest and wettest coastal district (i.e., the far north coast) is somewhat unsuitable for paspalum and there grasses such as Para grass (*Brachiaria mutica*) and molasses grass (*Melinis minutiflora*) are the chief cultivated pasture grasses.

In addition to the rain-forests of the coastal areas, there occur in the country lying between the coastal ranges and the crest of the Great Dividing Range, "scrubs" of a drier type. Softwood areas of this nature occur on basaltic soils and on rich alluviums, and in most of the settled districts the original timber has been felled and burnt and the land sown to Rhodes grass (*Chloris gayana*) for grazing by dairy cattle. Rhodes grass and paspalum have also been sown extensively after the clearing of heavily-wooded blackbutt forests lying close to the coast; and, on the cleared sections of the brigalow scrub areas of Queensland, Rhodes grass has been sown with good results.

Whilst the grasses mentioned above, together with lucerne, provide the bulk of the sown pasturage in Queensland, many other plants are of value in special situations and for special purposes. A number of these are described in a later section.

ESTABLISHMENT OF PASTURES.

Seed Quality.

When purchasing seeds of any description, farmers and graziers should satisfy themselves that their purchases at least reach the standard prescribed in the regulations under the Queensland Pure Seeds Acts, which are administered by the officer in charge, Brisbane seed testing station, Department of Agriculture and Stock.

The following sets out the absolute minimum percentage of germination in good seed:—

Kind of Seed.	Minimum Germination. Per Cent.	Kind of Seed.	Minimum Germination, Per Cent.
Grasses—		Millets, &c.—	
Cocksfoot	60	Japanese millet	75
Couch grass	40	*Setaria italica* (panicum)	75
Giant panic grass (blue panic)	40	White panicum	75
Italian ryegrass	65		
Molasses grass	20	Cereals—	
Paspalum	30	Barley	80
Perennial ryegrass	60	Maize	80
Phalaris	55	Oats	80
Prairie grass	65	Rye	80
Rhodes grass	30	Wheat	80
Wimmera ryegrass	65		
Clovers, &c.—		Miscellaneous—	
Alsike clover	75	Seed canary grass	65
Berseem clover	65	Cowpea	70
Black medic	70	Field pea	75
Burr medic	60	Peanut	60
Clustered clover	40	Rape	70
Lucerne	75	Sheeps Burnet	60
Red clover	75	Sorghum	70
Subterranean clover	70	Sudan grass	65
Townsville lucerne	40	Tares, vetches	60
White clover	70	Velvet bean	60

Not more than 2 per cent. of inert matter (i.e.), broken seed less in size than one-half of a complete seed, or chaff, dust, stones, or any material other than seeds, should be present in any seeds except in the following cases:—

Kind of Seed.	Maximum Inert Matter Per Cent.
Cocksfoot	3
Paspalum	4
Prairie	5
Rhodes grass	6

A maximum of 1 per cent. of weed seeds, or seeds of any kind other than the kind under consideration, is allowable.

The presence of the following seeds is totally prohibited:—

Dodder, datura (thorn apple), castor oil, and diseased or insect infested seeds.

The prohibited seed list and proportion of weed seeds allowed are at present under revision; when available these lists will be found to be much more stringent than is set out above.

The Department of Agriculture and Stock carries out free examination of samples of seed purchased by farmers for their own use, and if a farmer is not satisfied that the purity and germination of seed bought by him are up to the standard, he should at once send a sample to the

Head Office of the Department in Brisbane. The particulars which should be set out in ink on the package containing the sample are as follows:—

(*a*) Name under which seed was purchased;
(*b*) The number of bags from which the sample was drawn, and the number of bags in the consignment;
(*c*) The marks of identification, if any, on such bags;
(*d*) The name and address of the sender, with date of sampling: and
(*e*) The name and address of the sender's supplier, with date of delivery.

The samples should be addressed as follows:—

Seed Sample for Examination.

The Officer in Charge,
Seed Testing Station,
Department of Agriculture and Stock,
BRISBANE, B.7.

When sending samples, it is of the utmost importance that they be drawn by the sender from seeds in his actual possession, care being taken to make them truly representative of the bulk.

To enable this to be done satisfactorily they should be drawn alternatively from the top, middle, and bottom of the bags, the proportion of bags to be sampled being as follows:—

1 to 19 bag lots—A portion from each bag.
20 to 39 bag lots—A portion from not less than 20 bags.
40 to 59 bag lots—A portion from not less than 28 bags.
60 to 79 bag lots—A portion from not less than 32 bags.
80 to 99 bag lots—A portion from not less than 36 bags.
100 to 199 bag lots—A portion from not less than 40 bags.
200 bags and over—A portion from not less than 20 per cent.

If, when drawing samples, it is observed that great variation occurs in the bulk, two or more samples should be obtained, each representing bags whose contents are similar.

After the sample has been drawn as above indicated it should be emptied out on to a large piece of paper, thoroughly mixed, and then a quantity not less than the prescribed weight for such samples should be drawn for purposes of forwarding to the seed laboratory. A duplicate sample should be kept for reference.

In the seed testing station, great pains are taken to ensure absolute accuracy of work. It therefore follows that all this care is wasted unless the person forwarding samples for examination takes some trouble to ensure that the samples drawn truly represent the bulks from which they are obtained. The minimum weight of such samples is as follows:—

8 oz. for large seeds such as beans, cereals, etc.
4 oz. for lucerne, millet, sudan and such like seeds.
3 oz. for grass seeds.

In the case of seeds not mentioned above, the weight set out for the seed of nearest size, should be forwarded.

In the case of seeds obviously containing weed seeds or other foreign ingredients, not less than double weight mentioned should be sent.

Farmers and others, who grow seed for their own use or for sale purposes, should have some knowledge of what factors are responsible for variations in the agricultural value of seeds.

Immaturity of seed is a common cause of poor establishment in the field, and often is due to harvesting too early. Uneven ripening of seed, as well as a desire to harvest before any of the dead-ripe seed shatters, are responsible for the harvesting of much unripe seed. Some seeds, even though harvested when apparently ripe, require a resting or maturing period after harvesting and prior to sowing. Paspalum seed, for instance, germinates poorly if sown directly after harvesting; but if stored for some months its germinability is markedly increased. The storage period for any seeds cannot, however, be prolonged indefinitely. Under suitable conditions a small percentage of wheat seeds may retain its viability for about thirty years, but most seeds lose their germinability at a much younger age. The following figures have been supplied by F. B. Coleman, officer in charge, Brisbane seed testing station, and relate only to seed stored under the very best conditions available in Brisbane (i.e., in a brick building, airy, free from insects and from rapid changes in temperature). In all cases the seed was properly dry and free from decay. Any departure from these ideal storage conditions will result in greater loss of germination than is shown below. Humid conditions and/or prolonged lack of fresh air are particularly conducive to loss of viability.

Kind of Seed	AGE OF SEED.			
	1 Year. Germination Per Cent.	2 Years. Germination Per Cent	3 Years. Germination Per Cent	4 Years. Germination Per Cent.
Paspalum dilatatum	55	62	45	12
Prairie grass	70	60	Nil	Nil
Rhodes grass	50	40	26	15
Millets—				
Giant and dwarf setaria (giant panicum) (Hungarian millet)	88	76	56	20
Japanese millet	97	95	84	58
White panicum	91	81	74	65
Lucerne	91	80	59	50
Sorghum	91	85	69	47
Sudan (*Sorghum Sudanensis*) ..	94	90	82	59

Insect pests, such as weevils, often destroy large quantities of seeds and should be exterminated by fumigation. Unsound seed is to be avoided. Seeds which are cracked, chipped, or broken are very likely to have their embryos damaged, and even if the seed is capable of germinating, any breaks in its surface will admit fungi and so tend to lower the germination capacity.

The seeds of many legumes, including clovers, are peculiar in that a proportion has extremely hard and impermeable seed-coats, which delay germination for some considerable time. Under natural conditions this delayed germination of portion of the seed shed may be of considerable advantage; but under cultivated conditions a ready germination is almost always desirable. For this reason seeds of certain legumes are often scarified by scratching the surface with sandpaper, etc., or are treated with certain chemicals. Any treatment which increases the permeability of the seed-coat without injury to the seed itself permits of the quicker germination of hard seeds.

Certain pasture plant seeds carry the tiny fruits of disease-causing fungi. Much of the paspalum seed harvested since 1935 has been infested with spores (or fruits) of the fungus causing ergot. When this seed is sown the fungus is introduced to the area and, given favourable conditions, will develop and attack the seedheads of the new plants. Paspalum seed, containing visible "ergots" as a contamination, should not be used for sowing. Another grass which carries a disease in the seed is prairie grass. The disease referred to is smut and when it attacks a plant of prairie grass much or all of the seed may be rendered useless. The fruits of the smut fungus may be destroyed by treating the healthy seed with a disinfectant, as will be explained in a later section.

The Value of "Strain" in Pasture Plants.

When considering the purchase of seeds for pasturage one usually has the choice of several lots of seed of the same kind with varying prices. A solution of the problem is easily obtained by consideration of the fact that when purchasing animals one would ask for the pedigree. Seeds are life and the buying of good seeds with a pedigree is a sound proposition.

Many pasture plants are now grown in countries far removed from their original homes. Rhodes grass, for example, is a native of Africa which, within the past half century has been distributed to all other continents. It is only to be expected that in course of time the type developed in any particular area should differ in some respects from the types developed under different conditions of climate, soil, or management. In the case of Rhodes grass, for instance, lines raised from certain Queensland-grown seed are leafier than most African lines of the grass. Even at present a limited export trade in Rhodes grass is enjoyed by Queensland. Different types may, of course, develop within a small country, e.g., the perennial ryegrass grown in the Hawkes Bay district of the North Island of New Zealand is quite different from the perennial ryegrass grown in the Canterbury district of the South Island. The different types which occur within a species are known as "strains."

In countries in which pasture research is highly developed (e.g., New Zealand and Great Britain) commercial and other lines of seed of the locally most important grasses and clovers have been collected from many local and foreign sources and the best strains separated out by field trials. The seed-producing areas growing superior strains are in many instances permitted to be registered with the Department of Agriculture concerned and a certificate relating to the origin of the seed is issued. Thus we have on the market New Zealand Government certified perennial ryegrass and white clover seeds, New South Wales Government certified *Phalaris tuberosa* seed, etc. By purchasing certified seeds, the farmer is assured of obtaining seed harvested from areas which have been shown to the satisfaction of responsible authorities to be constituted of desirable pasture types.

A certain amount of work on the testing of strains of pasture plants has been, and is being, carried out in Queensland. The present position is summarised in the following table:—

Species.	Chief Seed Lines and Origin.	Remarks.
Rhodes grass	*Queensland grown	Strain work in progress
Couch grass	*New South Wales grown	. .
Molasses grass	*Queensland grown	. .
Giant panic grass (blue panic grass)	*Queensland grown	. .
Paspalum	*Queensland grown	Ergot-free seed desirable
	*New South Wales grown	
Prairie grass	*Queensland grown	. .
Cocksfoot	*New Zealand Government certified Akaroa	Strain work in progress
	Victorian	
	European	
Perennial ryegrass	*New Zealand Government certified permanent pasture	
	*New Zealand Government certified mother seed	
	*Victorian Government certified	
	New Zealand, Victorian, and New South Wales, uncertified	
Wimmera ryegrass	*New South Wales grown	
	*Victorian grown	
Phalaris	*New South Wales Government certified	
	New South Wales uncertified	
Millets and "Panicums"	*Queensland grown	
	*New South Wales grown	
Sudan grass	*Queensland grown	Strain work in progress
	*New South Wales grown	
Sorghums	*Queensland grown	
	*New South Wales grown	
Oats	*Southern States	
Barley	*Queensland grown	
	*New South Wales grown	
Italian ryegrass	*New Zealand Government certified	
	*New Zealand uncertified	
Seed canary grass	* Queensland grown	
Rye	*New South Wales grown	
Wheat	*Queensland grown	
	*New South Wales grown	
Lucerne	*New South Wales grown	
Sheeps Burnet	*Imported	
Townsville lucerne	*Queensland grown	
Burr medic	*Southern States	
Black medic	*Southern States	
Clustered clover	*Southern States	
Alsike clover	*Canadian grown	
Red clover	*New Zealand grown	
White clover	*New Zealand Government certified	
	New Zealand ordinary	
	European	
Subterranean clover	*Various Governments certified strains	
Peanut	*Queensland grown	
Velvet bean (including Mauritius bean)	*Fiji, New Guinea, and Papua	
Cowpea	*Queensland grown	
Rape	*Imported	
Field pea	*Southern States	
Berseem clover	*Imported	

* Recommended for use in Queensland in preference to other lines of seed of the same species

[TO BE CONTINUED.]

A Top-dressing Experiment on the Pastures of the Sandy Ridges of the Lockyer Valley.

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Introduction.

THE Lockyer Valley, in common with much of the West Moreton district, consists of black soil flats interspersed with sandstone ridges of the Walloon series. The flats are, for the most part, cultivated, while the ridges, which have been partly cleared, are used for the pasturing of cattle. The soils on these sandstone ridges are generally poor and shallow, podzolic in character, and carry a rather open stand of low fertility demanding plants, Bitter Blue or Pitted Blue grass (*Bothriochloa decipiens*) being the dominant grass. The carrying capacity of these pastures is low, a beast to 10 acres being a fair average.

In an attempt to improve the value of these pastures, a top-dressing experiment was laid out on a section of typical grassland at the Queensland Agricultural High School and College at the end of 1928. The purpose of the experiment was to study the increase in bulk and quality of the existing pasture plants, the encouragement of higher fertility demanding plants, and the stimulation of legumes, of which a few native species were known to occur.

The area selected (Macarthur 6 paddock) was a ridge with a fairly uniform southerly aspect, which was cleared of the original timber (mostly Ironbark—*Eucalyptus crebra*) in 1901 but not entirely stumped, and cleared of a second growth of ironbark in 1924-25, since when it has been used for grazing and burnt off approximately every two years—a fairly general local practice. The average annual rainfall is 28·6 inches with a decided summer maximum, approximately 17 inches falling within the period November to March, inclusive. The rainfall during the period of the experiment was a fair average, as shown by the following table:—

	1928. Points.	1929. Points.	1930. Points.
January	—	224	599
February	—	598	356
March	—	415	130
April	—	437	—
May	—	7	—
June	—	147	—
July	—	65	—
August	—	102	—
September	—	19	—
October	139	273	—
November	177	152	—
December	352	239	—

Treatments.

The fertilizers used were sulphate of ammonia, superphosphate (20·5 water soluble P_2O_5), and basic superphosphate, both singly and in some combinations. Basic superphosphate as a regular dressing was suggested on account of the somewhat acid nature of the soil. The fertilizers were applied as uniformly as possible with a standard type of fertilizer spreader.

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(3) Formerly Assistant Experimentalist, Queensland Agricultural High School and College.

Nineteen plots, each of approximately 1 acre, were laid out, systematically in a single range, each treatment being replicated once. Fertilizer applications were made in October, 1928 (after a burn) and December, 1929,—i.e., at the beginning of the rainy season, as follows:—

Plot No.	Treatment.	Applications in Cwt.		Total Application.
		October, 1928.	December, 1929.	
1	C	..	..	..
2	N	1N	1N	2N
3	2P + N	2P + 1N	2P + 1N	4P + 2N
4	C	..	..	..
5	P + N	1P + 1N	1P + 1N	2P + 2N
6	P	1P	1P	2P
7	C	..	..	..
8	7P	2P	5P	7P
9	BP	2BP	2BP	4BP
10	C	..	..	..
11	N	1N	1N	2N
12	2P + N	2P + 1N	2P + 1N	4P + 2N
13	C	..	..	..
14	P + N	1P + 1N	1P + 1N	2P + 2N
15	P	1P	1P	2P
16	C	..	..	..
17	7P	2P	5P	7P
18	BP	2BP	2BP	4BP
19	C	..	..	..

C = Control (no manure).
N = Sulphate of ammonia.
P = Superphosphate.
BP = Basic superphosphate.
Numbers represent cwts. per acre.

Early in 1930 it was noticed that the plots treated with sulphate of ammonia showed a better colour and a greater bulk of material than plots whose treatment had not included nitrogen. It was decided, therefore, to make a botanical analysis over the whole area in order to obtain an accurate picture of the developments that were taking place. This analysis was begun in February, 1930, and continued in March.

Sampling Method.

The method used was that of estimated percentage area. On each plot fifty throws of a mesh 2 links by 2 links, divided into 4, were made. The throws were made at random about points systematically arranged so that the whole of each plot was sampled. One throw was made on each plot in turn so that the effect of the time taken to complete the analysis might be overcome—a single series of throws was completed each half day. In each throw the total ground cover and cover of each species were estimated and the herbage then cut about an inch from the ground, this material being used to obtain weights and chemical composition.

Botanical Composition.(4)

The pasture is of complex type, fifty species having been recorded, though only twelve species occur with frequencies greater than 1 per cent. The average composition of the pasture was as follows:—

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(4) The original determination of species was done by Mr. C. T. White, F.L.S., Government Botanist, who visited the College for the purpose on several occasions.

Average Botanical Composition of Sandy Ridge Pasture at Gatton College.

	Per cent.
Percentage Cover	53.8
Fimbristylis diphylla	22.24
Bothriochloa decipiens	20.32
Eragrostis elongata	10.09
Eremochloa bimaculata	10.08
Brachiaria distachya (?)	6.88
Aristida spp.	5.25
Heteropogon contortus	4.73
Eragrostis leptostachya	3.74
Sporobolus elongatus	2.53
Cyperus spp.	1.56
Panicum effusum	1.24
Tripogon loliiformis	1.17
Eragrostis parviflora	0.97
Sida subspicata	0.87
Cynodon dactylon	0.87
Portulaca sp.	0.85
Cheilanthes tenuifolia	0.79
Epaltes australis	0.72
Jasminum suavissimum	0.66
Glycine tabacina	0.57
Digitaria divaricatissima	0.55

Traces of the following:—

Lagenophera solenogyne
Chloris truncata
Chloris divaricata
Chloris gayana
Chloris acicularis
Bothriochloa intermedia
Cymbopogon refractus
Paspalidium jubiflorum
Digitaria Brownei
Paspalum distichum
Themeda australis
Eriochloa punctata; Helichrysum apiculatum; Myoporum debile; Wahlenbergia gracilis.
Zornia diphylla
Cassia mimosoides
Indigofera baileyi
Evolvulus alsinoides
Boerhaavia diffusa
Calotis lappulacea
Tragus racemosus
Phyllanthus multiflorus
Glossogyne tenuifolia; Justicia procumbens; Ancilema gramineum; Portulaca oleracea; Rumex brownii; Eleusine indica.

(Results obtained from botanical analyses of 950 samples.)

For a more critical study of the pasture, the species were grouped as follows:—(1) Better type grasses; (2) Poor grasses; (3) Legumes; (4) Miscellaneous Herbage Plants; (5) Weeds; and (6) Cyperaceæ, the last group being formed on account of *Fimbristylis diphylla.* The components of the various groups are—

(1)

Eragrostis elongata
Eremochloa bimaculata
Brachiaria distachya (?)
Eragrostis leptostachya
Panicum effusum
Tripogon loliiformis
Eragrostis parviflora
Cynodon dactylon
Digitaria divaricatissima
Bothriochloa intermedia
Chloris acicularis
Chloris divaricata
Chloris gayana
Chloris truncata
Digitaria Brownei
Eleusine indica
Eriochloa punctata
Paspalidium jubiflorum
Paspalum distichum
Themeda australis

(2)

Bothriochloa decipiens
Aristida spp.
Heteropogon contortus
Sporobolus elongatus
Tragus racemosus
Cymbopogon refractus

(3)

Glycine tabacina
Cassia mimosoides
Indigofera baileyi
Zornia diphylla

(4)

Boerhaavia diffusa
Calotis lappulacea
Helichrysum apiculatum
Portulaca oleracea

(5)

Sida subspicata
Portulaca filifolia
Cheilanthes tenuifolia
Jasminum suavissimum
Aneilema gramineum
Evolvulus alsinoides
Epaltes australis
Glossogyne tenuifolia
Justicia procumbens
Lagenophora solenogyne
Myoporum debile
Phyllanthus multiflorus
Rumex brownii
Wahlenbegia gracilis

(6)

Fimbristylis diphylla
Cyperus spp.

The average botanical composition and percentage cover for the various treatments were then found to be—

Treatment.	Percentage Ground Cover.						
	Total.	Group Number					
		(1)	(2)	(3)	(4)	(5)	(6)
N ..	Observed 58·57	41·56	27·39	1·49	1·91	2·21	23·97
	Calculated 48·58	35·11	37·46	1·22	1·58	4·48	20·46
N + P ..	Observed 54·7	34·07	34·42	0·47	0·87	2·5	26·54
	Calculated 52·5	34·06	37·25	0·89	0·47	3·73	22·91
N + 2P	Observed 54·37	33·73	35·65	1·02	0·7	5·06	23·0
	Calculated 49·69	31·87	39·03	1·08	0·97	4·62	21·41
P ..	Observed 53·37	29·61	36·72	0·94	0·45	12·96	27·69
	Calculated 54·2	37·83	33·9	0·83	0·6	2·71	23·73
7P ..	Observed 51·77	41·84	25·84	0·79	0·47	2·70	23·29
	Calculated 55·83	42·99	29·15	0·93	1·07	2·19	22·53
BP ..	Observed 55·42	40·87	26·61	0·87	1·37	3·52	25·02
	Calculated 55·76	44·38	27·75	1·08	1·42	2·67	21·04
Control ..	52·26	37·24	34·38	0·99	1·06	3·09	21·86

(Calculated percentages were obtained in each case by taking the percentage of the two nearest control plots and using the formula—

Calculated percentage Plot 1 = $\frac{2C_1 + C_2}{3}$ where the order of plots is C_1, 1, 2, C_2.)

It will be seen that fluctuations of some size occur between the various treatments, but that these are more or less in accordance with the variations in the nearby controls, as instanced by the calculated figures. In no case does there appear to be any significant change in botanical composition as the result of treatment. The time factor, no doubt, is partly responsible for this result, and a further botanical analysis of the area after the lapse of several years might show a different result.

The low percentage of legumes present is a notable feature of the survey. The use of phosphate had failed to stimulate their development up till the cessation of the analyses.

Yields.

The material cut within each mesh throw was weighed to the nearest ½ gram on the plot (green weight). Each sample was then placed in a paper bag well ventilated with holes and hung in a dry shed for approximately a fortnight. The sample was then weighed (air-dried weight), heated in a hot-air oven at 110 degrees C. for two hours, and again weighed when cool (oven-dried weight).

Chemical Composition.

The samples from each plot, after oven drying, were chaffed, thoroughly mixed, and a representative sample taken and analysed for nitrogen and phosphates, the methods of analysis being those given in "Methods of Analysis of the Association of Official Agricultural Chemists" (Washington, 1925), 19, p. 7, and 7, p. 3, respectively. All analyses were duplicated.

Results.

Plot and Treatment.	No. of throws.	Average weight per throw (grms.).			*N per acre (lbs.)	*P_2O_5 per acre (lbs.)
		Green weight.	Air dried weight.	Oven dried weight.		
1·C ..	47	68·862	30·654	27·702	1138	513
2·N ..	47	125·489 (74·001)	51·970 (34·19)	47·002 (30·977)	1841 (1211)	489 (521)
3·2P + N	47	117·468 (79·141)	53·014 (37·726)	48·285 (34·252)	1896 (1283)	823 (529)
4·C ..	50	84·280	41·262	37·527	1356	537
5·P + N	50	116·920 (83·637)	55·928 (40·077)	50·737 (36·381)	1978 (1328)	921 (577)
6·P ..	50	95·120 (82·993)	43·856 (38·893)	39·697 (35·234)	1568 (1301)	895 (617)
7·C ..	50	82·350	37·708	34·088	1273	656
8·7P ..	50	70·730 (77·877)	31·793 (34·499)	28·589 (31·142)	1175 (1182)	755 (595)
9·BP ..	50	71·540 (73·403)	31·763 (31·290)	29·169 (28·197)	1239 (1091)	609 (534)
10·C ..	50	68·930	28·081	25·251	1000	472
11·N ..	50	99·950 (74·893)	44·021 (30·724)	39·806 (27·667)	1583 (1104)	701 (518)
12·2P + N	50	116·720 (80·937)	[illegible]6·525 (33·368)	42·089 (30·084)	1924 (1207)	949 (563)
13·C ..	50	86·820	36·011	32·500	1312	608
14·P + N	50	130·440 (82·693)	49·355 (34·003)	44·204 (30·656)	1661 (1402)	692 (569)
15.P ..	50	84·610 (78·187)	34·264 (31·094)	30·869 (28·818)	1287 (1494)	560 (530)
16·C ..	50	73·930	29·986	26·969	1585	490
17·7P ..	50	77·890 (72·513)	31·233 (29·285)	28·047 (26·357)	1109 (1446)	460 (501)
18·BP ..	50	67·220 (71·177)	26·857 (28·583)	23·979 (25·745)	1120 (1307)	567 (513)
19·C ..	50	69·800	27·882	25·133	1168	525

(* Lb. per acre = oven dried weight in grams per throw × % × 55.)
Calculated figures are shown in brackets after recorded amounts.

These results were analysed according to "Student's" method, and significant differences compared with check were found to be as follows:—

Treatment.	Difference Between Treatment and Check in				
	Green Weight.	Air Dried Weight.	Oven Dried Weight.	N. per acre.	P_2O_5 per acre.
N only	None	None	None	None	None
P only	None	None	None	None	None
P + N only	47·1%	41·1%	41·1%	42·9%	51·25%
BP only	None	None	None	None	None
All plots with P and BP ..	21·1%	19·1%	19·2%	None	30·8%
All plots with N	57·8%	43·2%	43·2%	44·4%	39·6%
P and BP only	None	None	7·7%	None	None

It will be noticed that the only significant differences were obtained from N + P combinations, the significant differences observed under the headings "All plots with P and BP" and "All plots with N" being due to the effect of the P + N plots which were included therein. The N + P plots showed significant increases in gross yield, in nitrogen yield, and in phosphate yield.

It is also to be noted that, with the exception of the "P and BP only" combination, there was no difference between air-dried and oven-dried weights, in so far as significances are concerned. For such pasture air-drying, even in the humid conditions of late summer, appears to be sufficient. Green weights give an indication of trends in such a mixed pasture, but differences in this case tend to be exaggerated.

As the increased yields of nitrogen and phosphorus over the two months of sampling are only of the order of the increase in total bulk, it is apparent that in a native pasture of this type there was, for the period in question, no increased assimilation of either nutrient. The pasture was more bulky but no richer as the result of the top-dressing. This result agrees with the suggestion made verbally by Professor A. E. V. Richardson to the authors—that our native species, having been developed under conditions of low nitrogen and low phosphates, are unable to make full use of additional supplies of these materials.

Economic Aspect.

An increase in yield of approximately 40 per cent. resulted during the months of February and March from the use of nitrogen and phosphate in combination. No other determinations were made. The carrying capacity of untreated land is generally considered to be one beast to 10 acres. The increased carrying capacity might thus be four beasts per 100 acres. If the value of a bullock be taken at a figure of £8, and 25 per cent. of the stock can be marketed each year, the increased return for these two months of maximum growth would be £8 per 100 acres per annum.

Against this must be set the cost of top-dressing. With fertilizer prices at, say, sulphate of ammonia 14s. per cwt., and superphosphate 5s. per cwt., and allowing 1s. 6d. per acre for costs of application (the standard fertilizer spreader used will cover 12 acres per day), the cost of top-dressing amounts to £1 0s. 6d. per acre (1P + 1N), which is £102 10s. per 100 acres. Making all allowances, this figure is greatly in excess of the pasture increment.

Even granting that smaller applications of manures might present a more favourable aspect, and allowing for residual effects over a period of a few years, the application of the tested fertilizers to such pastures is not economic.

Summary.

A poor natural mixed pasture on the sandy ridge country of the Lockyer Valley was top-dressed with a series of artificial manures. The experimental area was botanically analysed by the estimated percentage area method, and cuttings taken to estimate total yield and yield of nitrogen and phosphate.

The only treatment to give an increase was nitrogen and phosphate in combination. This increase was of the order of 40 per cent. in the yield taken over two summer months. There was no increase in percentage of nitrogen or phosphates.

No change in botanical composition was noticeable as the result of top-dressing.

It would appear that top-dressing of such a pasture, of low carrying capacity, is not an economic procedure.

Acknowledgment.

The authors wish to acknowledge the assistance given by Mr. C. T. White in the determination of species and Mr. A. McD. Armstrong, B.Ag.Sc., in his supervision of the chemical analytical work.

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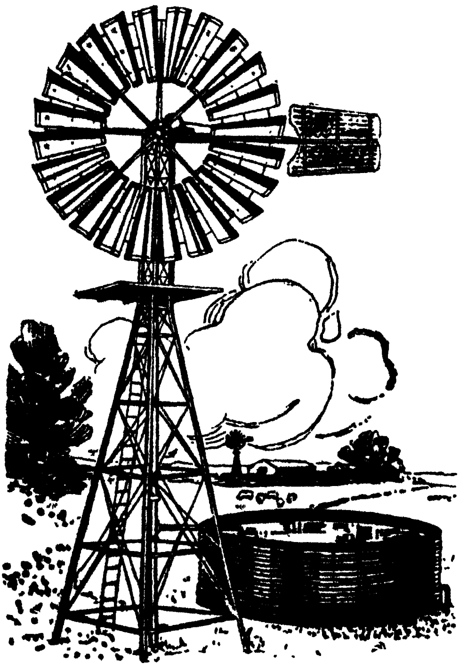

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the form of nitrate. Nitrogen increases the growth of plant and foliage, and deepens the green colour of the leaves. It also increases the size of the leaves. The pale yellowish tinge that occurs sometimes in green foliage may be caused through an insufficient supply of nitrogen to the plant, though this yellow tinge may be caused by other deficiencies. Plant leaves in sunlight have the power of fixing the carbon dioxide of the air and converting it into sugar which, being soluble, is circulated to different parts of the plant in the plant sap. Excessive supplies of nitrogen will cause an excessive succulence of growth rendering the plant less resistant to disease.

The fertilisers used for supplying nitrogen in Queensland are:—nitrate of soda, which is very quick-acting (the nitrogen being in the form of nitrate); sulphate of ammonia, which also is quick-acting; and blood manure which is fairly quick-acting, as its nitrogen is soon converted into the nitrate form in the soil. The nitrogen in bonedust and meatworks fertiliser is slow acting, as decomposition of the bone in the soil has to take place before the nitrogen is in an available form for plants.

Phosphoric acid as a plant food ingredient influences the production of seed, stimulates root growth and generally hastens the maturity of crops. A number of Queensland's soil types are insufficiently supplied with phosphoric acid; and, on such soils, good results have been obtained from the application of phosphate fertilisers. Superphosphate supplies phosphoric acid in a water soluble form and is therefore quick-acting. As bonedust has first to be decomposed, its phosphoric acid does not become available so readily to plants. Nauru phosphate is also a slow-acting fertiliser, and the effects from its application are more noticeable in the year after application.

In regard to potash, this plant food ingredient influences the production of carbohydrates, and the pulp of fruit and woody structure of plants. Potash is essential for the leaves of plants as it is required in the leaf process, mentioned before, of the conversion of carbonic acid into a carbohydrate, and also for the translocation of this carbohydrate throughout the plant. The potash fertilisers commonly used in Queensland are sulphate and muriate of potash, both of which are quick-acting fertilisers. Wood ashes also contain various amounts of potash, but coal ashes contain practically none.

The necessity for having a balanced supply of the food ingredients mentioned, may be explained, as follows:—A large supply of nitrogen causes excessive and a very succulent foliage growth with low disease resistance. Potash influences the production of carbohydrates and woody substances, and for that reason potash will counteract the effect of too much nitrogen. Potatoes may be mentioned as a crop which noticeably shows ill results through an application of unbalanced fertilisers; for, if a fertiliser with high nitrogen content and somewhat low potash content is applied to this crop, it will cause excessive leaf growth, but there will be insufficient potash throughout the leaves to influence the production of enough carbohydrates for the growth of satisfactory tubers. It will be seen then, that, with the application of a large amount of nitrogenous fertiliser, it will be advisable also to apply an ample amount of potash fertiliser.

Lime (containing the element calcium) though liable to be washed out of the surface to a considerable extent, is present in most soils in sufficient quantities to meet the actual food requirement of plants. Lime is applied to the land more for the purpose of reducing soil acidity, and the obtaining of good soil tilth, than for plant food. In addition it must be mentioned that some crops such as lucerne and cabbage, require the presence of ample lime in the soil, whereas maize and sorghum will flourish on soils of a more acid nature.

Plant food material applied in fertilisers is rendered more available, if farmyard manure is applied at the same time as the fertilisers, even though the farmyard manure may be available in only a relatively small amount.

Investigations respecting the plant requirements of elements other than those previously mentioned have shown that a deficiency of some elements, even though they may only be required by plants in mere traces, causes poor plant growth and plant disease.

Chlorosis, that is the abnormal yellowing of the plants' green leaf, may be caused through the deficiency of certain plant nutrients. Iron is necessary for the formation of the green colouring matter (chlorophyll) of the leaf, and a deficiency of this element will cause chlorosis. There may be an abundance of iron in the soil, but if the soil has a high lime or manganese content, the assimilation of the iron by the plant will be prevented. This form of deficiency has been remedied in many cases by spraying with iron sulphate, or by applying the iron sulphate to the soil. It has been reported that in some cases, the spraying with iron sulphate and the application of iron sulphate to the soil, did not improve the condition of chlorotic apple trees; but that the injection of iron salts into the trunk of the tree was beneficial. The driving of iron nails into the trunks has also produced effective, though slower, results.

Copper is another element that may have considerable effect in maintaining healthy plant growth. In an investigation in connection with a type of chlorosis and "die-back" of fruit trees, it was found that the trouble was not remedied by the application of potash, iron, manganese, magnesium or sulphur; but that the application of copper sulphate to the soil surrounding the affected trees, at the rate of ¼ to 2 lb. per tree, restored the trees to a normal condition.

That plants require for their most successful growth some of what may be termed the less abundant elements is recognised, and the element boron has been applied to some crops with favourable results. Zinc also has been reported as having been successful in controlling chlorosis of some plants.

The action in plant growth of these less abundant elements has been designated by such terms as "catalytic" or "complementary"; but it has to be stated that the elements boron and zinc, in any slight excess, have a very deleterious effect upon plants.

There are elements required by plants which in some soils, may exist in ample quantities, whilst other soils may be supplied only poorly with them. There are some plants, too, which require more than others of a particular element; and in this connection, magnesium and manganese, may be mentioned.

Magnesium is generally present in the soil in sufficient quantity for plant requirements; nevertheless, there are occasions when the application of magnesium salts have proved beneficial to crops. Thus magnesium is applied in some fertilisers for tobacco. In some citrus orchards in New South Wales chlorosis is considered as possibly due to magnesium deficiency.

Manganese also is usually present in sufficient quantity in the soil; and, in some cases, in such quantity as to prevent the assimilation of iron by plants. But, in some countries, experiments with the application of manganese salts has improved the quality of citrus fruit; and, in some of the experiments, has reduced chlorosis among the citrus trees.

VENT PICKING BY POULTRY.

Every year numerous pullets are lost as a result of vent picking, an acquired vice, which is easily checked when correct control measures are adopted in the early stages. If neglected or overlooked until it is firmly established, control is much more difficult. This vice is confined chiefly to pullets and starts shortly after they commence laying. At times outbreaks will occur among older hens, but in these it is usually less extensive.

Vent picking starts as the result of one bird picking the vent of another bird when it is expelling an egg. The picking causes bleeding and frequently protrusion of the oviduct follows. Once the birds acquire the taste of blood, they are ever on the alert for victims. The pecked bird may be able to get away from the attacker, but in all probability egg laying will keep the wound open and it often becomes septic, resulting in a whitish watery discharge from the vent. Eggs laid by the injured bird will frequently be smeared with blood.

Treating seriously injured birds is of little value, because they seldom make a complete recovery. If considered advisable, however, the injured parts of birds that have been pecked may be painted with Stockholm tar twice daily.

All nest boxes should be darkened by hanging bag curtains in the front of the openings. These curtains encourage the birds to lay in the nests, and, to some extent, reduce the liability to pecking.

As pecking is usually the outcome of idleness, a handful of small grain should be scattered twice daily in the litter on the floor to keep the birds busy scratching for food. If the quantity of litter is insufficient, open a bale of straw in the centre of the shed and allow the birds to scatter it over the floor. The litter supplied should cover the floor to a depth of about 4 inches. At the present time litter is costly, but it would be cheap in comparison with the value of the birds that may be lost from vent picking without its aid. Where litter is not available, some relief may be obtained by feeding a very small meal of wet mash twice each morning for several days. The feeding times could be at approximately 8 a.m. and 11 a.m., and the quantity fed at each meal need not exceed 4 lb. dry weight per 100 birds.

—*J. J. McLachlan.*

Veterinary First-Aid Chests.

TREATMENT OF COMMON AILMENTS IN STOCK.

ROSS NOTT, B.V.Sc., Government Veterinary Officer.

SINCE many cases of sickness in animals can be treated by the use of simple remedies immediately the illness is noted, it is very necessary that a supply of these should be kept always on hand in the form of a veterinary first-aid chest. In order that farmers and graziers may make proper use of these drugs, the following notes have been collected which summarise the uses of the drugs and the treatment for common ailments of stock.

It should always be kept in mind, however, that in every case where a contagious or infectious disease is suspected, graziers and farmers should report the outbreak immediately to their nearest Veterinary Officer, Stock Inspector, or to the Department of Agriculture and Stock, Brisbane, in order that measures may be taken for treatment and control.

Boracic acid is a mild antiseptic, and is used for eye lotions, mouth washes, and dusting powder for wounds.

Zinc oxide is useful as a dusting powder for wounds. An ointment can be made by mixing one part of zinc oxide with four parts of lard or vaseline.

Lysol is a powerful disinfectant, used for the treatment of suppurating wounds, and the sterilisation of instruments.

Mercury-perchloride tablets (corrosive sublimate) are a powerful disinfectant and antiseptic, used for the washing and irrigation of wounds. As, however, it will corrode all metals, it should not be used for the disinfection of instruments.

Camphorated oil is a mildly stimulating and soothing liniment. It is used for massaging the udders of cattle affected with mammitis (inflammation of the udder.)

Strong tincture of iodine is a strong antiseptic, used for the dressing of cuts and wounds. For use, one part of the tincture should be added to three parts of methylated spirits.

Zinc Sulphate tablets, each containing 10 grains, are used in the treatment of sore eyes where there is an opacity on the front of the eyeball. One tablet dissolved in 2½ oz. of boiled water and half a teaspoonful of boracic acid makes an efficient eye lotion.

Oil of turpentine, when administered internally with oil, will prevent fermentation. It may be applied externally as a disinfectant, and is useful for applying to wounds in conjunction with olive oil, or raw linseed oil.

Aromatic spirits of ammonia (spirits of sal volatile) is a general stimulant. The dose for a horse is 1 to 2 oz.; for sheep,½ oz. to 1 oz.; for cattle, 1 to 2 oz. It is used as a stimulant in the treament of colic, but should be well diluted to prevent the irritation of the mouth.

Spirit of nitrous aether (sweet spirit of nitre) is a stimulant. It prevents griping, lowers the temperature, and is used in the treatment of colic and kidney trouble. The dose is the same as that for spirits of sal volatile.

Powdered nux vomica is a nerve stimulant, and is used for restoring tone to the bowels. It is beneficial in treating debility and other diseases in which the patient is weak. The dose for horses and cattle is one teaspoonful twice a day.

Sulphate of iron is a tonic and is also used in the preparation of the antidote to prussic acid poisoning.

Tincture of perchloride of iron is a tonic and is also used in the preparation of the antidote to arsenic poisoning.

Measures:—1 fluid dram = 1 teaspoonful; 1 fluid oz. = 1 tablespoonful; 2 fluid oz. = 1 wineglassful; 2 tumblerfuls = 1 pint; 20 fluid oz. = 1 pint.

In addition to the drugs and medicines mentioned, the following materials are generally obtainable from the home:—Copper sulphate (bluestone), turpentine, raw linseed oil, ginger, starch, treacle, honey, mustard, washing soda (carbonate of soda), baking soda (bicarbonate of soda), household cloudy ammonia, Condy's crystals, common salt, etc.

Digestive Disorders.

Colic in Horses.—(*a*) Impaction (stoppage of bowels); sand colic.—Give the following drench:—Raw linseed oil, 1-1½ pints; turpentine, 2 oz. Shake up thoroughly before giving. Follow three hours later with this draught, which can be repeated every three hours, if necessary:—Spirits of nitrous aether, 1oz.; aromatic spirits of ammonia, 1 oz.; treacle, 1 cupful; water, 1 pint. If there is no improvement in the case in 24 hours the whole treatment should be repeated.

(*b*) Flatulent (windy) Colic.—Give this drench:—Raw linseed oil, 1-1½ pints; turpentine, 2 ozs; aromatic spirits of ammonia, 1 oz. (or household cloudy ammonia, ½ oz.).

(*c*) Spasmodic Colic.—Drench with the following mixture:—Aromatic spirits of ammonia, 1 oz., spirits of nitrous aether, 1 oz.; treacle, 1 cupful; water, 1 pint.

Note.—In all cases of colic, the medicinal treatment should be supplemented with enemas of warm, soapy water. To do this a length of hose ½ in. in diameter and 6 ft. long, with a funnel in one end, is required. The hand, washed and oiled, carefully carries the free end of the hose as far forward as possible into the passage, and 3 to 4 gallons of the solution is slowly introduced through the funnel. The enema should be repeated every three or four hours if necessary.

The farmer should note that the condition often termed by him "stoppage of water" is generally a form of colic and should be treated as for impaction.

Indigestion in Cattle—(*a*) Impaction of the paunch; constipation, stoppage.—The following mixture should be used as a drench:—Epsom salts, 1-1½ lb.; household cloudy ammonia, ½ oz.; ginger, 2oz.; treacle, 1 lb.; warm water, 2 pints. (To mix, dissolve the salts in 1 pint of water and treacle in the other pint, mix together, and add the rest of the ingredients.) This drench should be repeated in 24 hours if necessary. In cases of impaction this should be followed up by a heaped teaspoonful of powdered nux vomica given night and morning for three days.

(*b*) Hoven or Bloat.—The following drenches are suitable:—No. 1—turpentine, 2 oz.; household cloudy ammonia, ½ oz.; cold thin gruel, 2 pints. No. 2—Condy's crystals (small teaspoonful) dissolved in a quart of warm water. The medicinal treatment should be supplemented by gagging and light exercise. In severe cases the paunch should be punctured on the left side, a trocar and canula or a clean sharp pocket knife being used for the purpose.

Digestive Disorders in Sheep.—The same treatment should be given as for cattle, one-quarter of the dose of the various drugs being used.

Indigestion in Pigs.—The following purgatives are suggested:—Castor oil, 1-4 oz. (according to size) in warm milk; or linseed oil, 2-8 oz. (according to size); or Epsom salts, 2-6 oz. (according to size). The purgative drench may be supplemented by putting the pig on to small, sloppy feeds.

Other Common Conditions.

Wheat Gorge and Laminitis (Founder) in Horses.—As soon as this condition is observed a drench made up of a solution of bicarbonate of soda (baking soda) should be given. The dose is one cupful of soda dissolved in a quart of water. This drench should be repeated, if necessary, every two hours. The patient should be allowed plenty of drinking water. Three hours after the first drench a draught containing—raw linseed oil, 1-1½ pints; and turpentine, 2 oz. should be given. The soda drench should be given night and morning on the two following days. Where stiffness of movement is present, the horse's heels should be lowered with a rasp and the animal stood in water during the day. It should be taken out at night and put on soft standing. A light ration should be given, but no grain.

Ergot Poisoning (Cattle).—A drench of any purgative mixture should be given without delay in order to get rid of the offending matter. A mixture of 1 lb. Epsom salts and 1½ oz. ginger, dissolved in one quart of warm water, would serve the purpose. If recovery is slow a tonic should be given, such as:—Sulphate of iron, 2 drachms; powdered nux vomica, 1 drachm; Epsom salts, 2 oz.; powdered gentian, 2 drachms. This should be mixed into a powder and given with treacle night and morning for 3 days.

Milk Fever.—The udder should be washed with lysol solution (tablespoonful of lysol to a pint of water). A boiled teat syphon, which has been attached to the enema syringe (the latter should also be put into disinfectant if it has been used for other cases) should be inserted into the teat and air injected into the quarter until it is quite firm. This should be repeated for each quarter. The teats should be tied with tape, which should be removed in two hours' time. The injection of air should be repeated in three hours if the animal has shown no signs of recovery. The patient should be kept propped up on its brisket after the injection.

Mammitis (Inflammation of the Udder).—The animal found suffering from this trouble should be isolated. Hot fomentations should be applied to the affected quarter, and it then should be massaged with camphorated oil (warm). This should be done three or four times daily, and it is important that the quarter should be stripped out many times during the day.

Further, the patient should be given a purgative drench as has been suggested for impaction of the paunch. The hands of the attendant should be disinfected before proceeding to milk healthy cows.

Inflammation of the Eye.—The eye should be examined carefully for the presence of foreign bodies, such as a piece of chaff. If any are present a few drops of castor or olive oil should be put into the eye sac, and the foreign substance removed with forceps. The following eye lotions are recommended:—

(1) Acid-boracic (two teaspoonfuls to the pint of boiled water). To this can be added 10 tablets of zinc sulphate (each tablet contains 10 grains).

(2) Where a white film is present over the eyeball, use perchloride of mercury solution (one tablet to six pints of boiled water).

Arsenic Poisoning.—The animal should be given as a drench a mixture containing 1½ oz. tincture of perchloride of iron in a wine-glass of water, and ½ oz. of carbonate of soda in a half tumblerful of water. This should be repeated, if necessary, at intervals of two hours. Lime water also should be given.

Prussic Acid Poisoning.—A mixture containing 1 oz. carbonate of soda in 1 pint of water, added to ½ oz. sulphate of iron in 1 pint of water, should be given as a drench.

Treatment of Surgical Conditions.—(*a*) Bleeding.—This is best controlled by pressure. The most common method is to place a pad of cotton wool or clean linen cloth soaked in turpentine on the wound, and bandage tightly over it. If there happens to be a large vessel cut, and its end exposed, it can be clamped with artery forceps: A small pair of pliers which have been well boiled will do in an emergency. For severe bleeding a tourniquet may be applied (to a limb) above the wound. This may be improvised by tying a cord round the leg loosely, and then twisting a stick in it till it is so tight that it stops the circulation. It should be removed as soon as possible.

(*b*) Abscesses.—The swelling should be clipped and hot fomentations, or a blister of mustard and warm water (the consistency of table mustard) should be applied. When pointing occurs the swelling should be opened up at its lowest point so as to ensure drainage. It should be syringed out frequently with iodine solution made by adding tincture of iodine to water till a deep sherry-coloured mixture is obtained.

(*c*) Wounds in general.—In all cases cleanliness is essential. The hair should be clipped around a wound, which should then be washed with warm water and soap with a view to removing any foreign matter. The wound should be bathed with a disinfectant solution, e.g., lysol (1 tablespoonful to 1 pint of water); perchloride of mercury (1 tablet to 1 pint of water); tincture of iodine; turpentine. If practicable, a pad soaked in the disinfectant should be applied and a bandage put over it. Later dry dressings could be used. A useful one is made of equal parts of starch, zinc oxide, and boracic acid. A useful fly repellant is—lysol, ½ part; turpentine, 1 part; olive oil or raw linseed oil, 20 parts.

(*d*) Punctured wounds of the foot.—These require special treatment. The wound should be well opened up so as to allow it to drain freely. It should be swabbed out with pure turpentine or lysol, and it is essential that the wound should be kept clean. It should be fomented daily with a bran poultice, to which lysol or other disinfectant has been added.

(*e*) Lacerated wounds of the skin.—These should, where possible, be sewn after cleansing.

(*f*) Udder injuries, cracked teats, etc.—All wounds and contusions should be kept clean and smeared with ointment, e.g., zinc oxide ointment.

(*g*) Proud flesh on limbs.—This should be dressed daily by rubbing with a piece of copper sulphate (bluestone), and then bandaged tightly.

Administration of Medicines.

Liquids are most suitably given as a drench. Care should be taken in giving oil drenches to horses. The medicine should be well shaken, and given in small quantities. Rubbing, pinching, or other interference with throat or neck parts should not be indulged in. In drenching pigs a satisfactory method is to use an old piece of hose. Oil should be mixed with warm milk to make it run freely.

Powders are best given by mixing with treacle, honey, or jam to form a thin paste, which is then smeared on the back teeth and tongue with a thin flat stick.

SHEEP LANDS FOR GRAZING HOMESTEAD SELECTION.

KATANDRA RESUMPTION.

Portions 8 and 9, parish of Katandra, comprising part of Katandra resumption will be open for grazing homestead selection at the Land Office, Hughenden, on Thursday, 5th August, 1937.

The portions are situated from 16 to 20 miles south-easterly from Whitewood, on the Hughenden-Winton railway, and comprise very open downs country grassed with Flinders, Mitchell, Blue, Button, and other grasses and are suitable for woolgrowing and fattening.

Portion 8 is sufficiently watered, but more water will need to be provided on portion 9.

The areas of the portions are 35,931 acres and 36,091 acres respectively.

Each selection will be for a term of 28 years and the annual rents for the first 7 years are 2d. per acre and 1¾d. per acre respectively.

Each selection will be subject to the condition that the selection must be stocked with the applicant's own sheep within 3 years.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent. Hughenden, and the Government Tourist Bureaux, Sydney and Melbourne.

The Importance of "Type" in Merino Flocks.

J. L. HODGE, Instructor in Sheep and Wool.

LORD Barnby, when visiting Australia on a wool publicity mission, referred to the importance of breeding to type and suggested that this was preferrable to undertaking elaborate woolclassing. This was not intended as a reflection on woolclassing, as some people thought, but apparently Lord Barnby desired to stress the importance of fixing a type in the flock and thereby *simplifying* woolclassing.

The importance of the advice given cannot be overestimated. Generally speaking, insufficient care is taken in mating the flocks of the State. The fixing of a type, or even the attempt to do so, is often sadly neglected. Far too many people are under the impression that rams of any type will do, whereas, in reality, the selection of a certain type of ram to mate with the ewe flock should be one of the major considerations of the year It must be recognised at once that there are no short cuts to this desirable achievement and the question arises: How is this fixing of a type to be brought about in the shortest number of years?

Firstly, the ewes must be regularly culled, having in view the exact type of sheep required for a particular district. Apart from the covering, ewes would be discarded for other faults such as lack of size, malformation of any kind, devil's grip, or want of constitution or conformation, these being amongst the most commonly found faults in the average flock.

A line of classed ewes, having been secured, the ram should be chosen on the assumption that like gets like; but, taking into account also the rapid manner in which merino wools fine up under western conditions, it will be wise to select rams several counts stronger in the wool fibre than that of the ewes with which they are to be joined. A violent contrast such as really strong woolled rams on fine ewes, is not on any account to be recommended. This would be only an abortive attempt to do in one year that which, under the most favourable of conditions, cannot be accomplished under four or five years. The mating of sheep of very fine wools with those of very strong wools results in the progeny throwing all ways instead of the medium, which was to be desired.

Many graziers fail to regard the purchase of rams from the right business angle. Granted the knowledge necessary to select the right type of rams, it needs only a simple sum in arithmetic to estimate the financial advantages to be derived from the choice of a higher grade of animal rather than the so-called cheapest flock rams. These rams are *not* the cheapest, and one crop of lambs should be sufficient to convince the grazier of a "penny wise, pound foolish" attitude. No additional expenditure on the property can be better justified than an extra amount spent in rams; provided, of course, that the grazier, or the expert he employs for the purpose, has the knowledge necessary to make the right selection.

The quickest way then to establish a type of merino sheep on the property is to combine an annual culling with the selection of better rams. Either of these operations is important and will give results, but one is incomplete without the other.

The selection of the stud from which the rams are to be purchased is of outstanding importance. The type desired must, of course, be procurable there. The age of a stud should be taken into consideration, because provided the stud has not slipped back, the prepotent power in the rams, or the probability of rams reproducing progeny like themselves, is more likely to be firmly established.

It is important in the fixation of type that, being suited by a particular stud, the grazier should stick to that stud unless a very good reason can be given for a change.

The joining of flock ewes with the rams there leads to what is called indiscriminate breeding. Apart from the culling of the ewes and the selection of the rams no attempt whatever at selective breeding is made. If the paddocks are available, it is safe to assume that, even amongst the flocks, something useful and profitable could be done in this way. Again on the assumption that like gets like, it appears to be well worth while to select carefully the ewes to mate with rams likely to suit them from a wool point of view, and thereby bring about some measure of selective breeding.

By way of helping the grazier in this respect, the Department of Agriculture and Stock has made a start with some stud breeders in the matter of typing the flock rams before sale. In the past, it has been a common practice, in cases in which rams of a certain type have been recommended, for the stud master to give a run of rams at a certain agreed price. This results frequently in a buyer getting fine medium and strong rams in direct opposition to the advice tendered with regard to type. The result is deeper and deeper culling and a loss of years in the establishment of the type suitable for the property and district.

In the selection of rams, it does not follow that, because a certain type is recommended for one district the same advice would be equally applicable to another part of the State. For far-western and central conditions, it should be the object of the grazier to produce a strict medium, and to accomplish this and keep it, it is necessary, as before pointed out, to use rams slightly stronger than the ewes with which they are to be joined. In areas nearer to the coast the production of finer wool may be encouraged, provided that constitution is in no way sacrificed. It should always be remembered that of the two—price per head, or price per lb.—the sheep showing the former result should be chosen especially for the West and Central parts of the State where constitution plays such a big part in times of drought.

It may be thought from the foregoing that the writer holds a brief for the strong type of merino as against the finer wools. Such is not the case except where it is definitely proved that sheep of the stronger type are more likely to do well under adverse conditions. After all it is not a matter always of what individual graziers would like to breed, but a case of the choice of a particular type being made imperative in a particular district.

In the best interests of the sheep industry, it is not desirable for cull ewes to be passed on to a neighbour as breeders. It would be far better for them to be fattened and sold for the purpose of slaughter. There is no law against the selling of cull ewes as breeders; but the prospective buyer would be well advised to steer clear of such in the formation of his flock.

On certain properties where the culling of a definite percentage every year takes place, and the use of good rams has long been a definite policy, a good line of ewes may be secured. These, then, will require culling before the rams are joined.

Like everything else on the land, the question of fixing a suitable type on a certain property in a given district resolves itself into what is profitable and what is not. A bad sheep eats just as much as a good one; but the economic consideration goes further than that, inasmuch as a bad ewe reproduces her kind, or more probably still produces a lamb inferior even to herself.

The practice of culling therefor is definitely profitable to the grazier. A well constructed jetting or branding race is admirably suited to the purpose. The nearer ewes are to being full-fleeced the better for culling purposes. Culling should also apply to the ewe hoggets. Only those conforming to the type decided upon, and filling the bill in every other way, should be retained as future breeders.

Constitution is of paramount importance and, after that comes the covering. Density, length of staple, colour and quality are all necessary in the selected breeder. Quality does not necessarily refer to coarseness or fineness of the fibre, but embraces such characteristics as breeding and softness in handling. Quality, therefore, may be found in a strong wool just as often as in a fine wool.

No known domesticated animal responds so quickly to careful and selective breeding as the sheep. It is equally true that there is no shorter cut to increased returns than in the elimination of the unprofitable and the retention of the profitable animal.

From every point of view, the culling of the ewe flock, and the introduction of better rams with the object of fixing a type, has everything to commend it and nothing against it.

Having established a good flock, care should be taken to feed them adequately. Half the troubles in the flocks are brought about by overstocking at some period of the year. Under-nourished sheep lend themselves readily to the infestation of internal parasites, and are not constitutionally able to withstand the attack. Then again, it is not possible for a half-fed sheep to produce either the fleece or the lamb which would be expected in the case of a properly nourished animal.

It should be apparent that not only should the quality and type of the flock be brought about in the manner indicated, but that having the flock, it is in the interest of the grazier to maintain the health of every animal in it at the highest point.

SELECTING NEW BANANA AREAS.

With the approach of winter, intending banana growers would be well advised to pay more than a little attention to the aspect of the areas shortly to be felled for the 1937 planting.

Of late years, bananas have been grown extensively and successfully on inferior forest country; but, in most instances, suitable aspects, assisted by good cultural methods, have been the chief reasons for success.

The ideal aspect, of course, is the north-east or northerly slope, with standing timber on all four sides to give the necessary shelter from strong winds. These aspects ensure the maximum amount of winter sunshine.

With sites facing any further into the east than north-east, great care should be taken that, as far as possible, the area is sheltered from the cold south-east winds. An efficient windbreak on the south side of an easterly patch should, therefore, be provided for in the clearing plan. The site chosen should be so situated that tall timber or hills at the top of the proposed area will not shut out the winter sun at an early hour.

A westerly slope is preferable to south-east, south, or south-westerly slopes, if heavy belts of timber block the not very frequent strong westerly winds. Many good bananas have been grown on westerly slopes of this description, chiefly because the areas in question receive the sun during the whole of the afternoon.

All southerly slopes should be definitely avoided, more particularly if there is open country for any distance around the proposed area, but if a southerly slope has to be used it must be well sheltered. Much more timber will have to be felled than is actually required for planting, to obviate the long shadows which standing timber at all close to the patch throws over the plantation. The limited period during which they are exposed to the sun is the chief objection to all southerly slopes. Southerly slopes possess some slight advantages over other aspects, in that they usually bear for a longer period and the fruit is less subject to banana thrips rust.

However, when one considers that a good warm-slope plantation will produce from one to three bunches to every one on the cold-slope areas, production costs, particularly to the grower on leased ground, enter so largely into the picture that intending growers with a choice of ground should always choose a warm situation to gain the best results from their work.

—*J. R. Horsley.*

Tomato Culture.

H. J. FREEMAN, Senior Instructor in Fruit Culture.

TOMATO growing is an important industry in Queensland. The fruits of the tomato plant serve a wide range of uses, for they may be eaten raw, as sliced tomatoes, or in salads. They may be made into soups, sauce, pickles, jam, preserves, and their possibilities for use in combination with other foods are only limited by the housewife's creative fancy.

Tomatoes are grown under a great variety of systems. They are almost universally grown in home gardens, and in fact few gardens are so small that there is not sufficient room for at least six or more plants. Indeed, it is surprising how far a few plants will go towards supplying the average family with an abundance of wholesome fresh fruit.

Commercially tomatoes are produced by market gardeners who may be found near any populated group, from the smallest to the largest towns.

Botanically the tomato belongs to the family Solonaceæ. It is a near relative of the potato, and is susceptible to many of the diseases of the latter. Usually it is easy to grow in our climate as a plant; but as a commercial field crop it requires care, skill, and knowledge of local climatic and soil conditions. Bountiful crops are often obtained on newly burnt off scrub land, but for continuity of commercial production land that is easily cultivated by either horse or motive power is the desired site, all other necessities being taken into consideration. Though some excellent results have been obtained from year to year from the old system of planting, i.e., allowing the plants to spread out over the surface of the ground, the necessity for early maturity and heavier crops, the prevalence of diseases and pests, and the consequent vital necessity to spray or dust, now warrants that very careful consideration be given to either the staking or trellising methods used by progressive growers and explained later in this pamphlet.

When interested commercially, irrigation in some form or other is almost indispensable, for to depend upon the natural rainfall often means that one has a crop only when everyone else has one, with the corresponding glut prices, or total failure, according to whether the season is wet or excessively dry. Since the pamphlet refers to tomato growing mainly from a commercial viewpoint, this factor cannot be too strongly stressed. The commercial grower must also be prepared to spray or dust, thus guarding against the several diseases and pests capable of ruining his crop. To neglect these precautions renders the cultivation of the tomato hazardous to a degree.

Plate 5.
TRELLISED TOMATOES.—Note young top growth.

SOIL REQUIREMENTS.

Although the tomato has a wide range of adaptation to various soil types, the actual sites selected for tomato areas must not be subject to frost, and should have reasonable shelter from high winds. The ideal soil is a fine alluvial loam with good fertility and efficient drainage, though some excellent crops are obtained frequently from basaltic soils in elevated areas.

The soil should be deeply cultivated and should not be subject to "caking" under any conditions. It should have good moisture-retaining properties, obtained by the possession of a liberal humus content. Whilst some soils are recognised as being ideal, it should be borne in mind that

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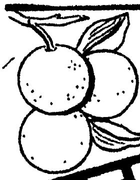

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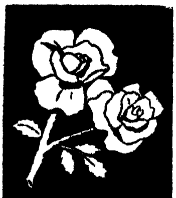

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tomatoes will grow in almost any reasonably good soil, provided a few precautions are observed and the weather conditions are favourable. It is not considered that a very rich soil is most desirable, for such often induces a tremendous leaf growth at the expense of fruit production. Such growth is particularly succulent and appears most susceptible to the attack of fungus diseases. Definitely a more suitable soil is one of good medium fertility, in really good cultural order, and to which the necessary fertilizer elements are supplied as required.

Plate 6.
A fine cluster of young fruit.

SEED-BEDS AND PLANTING.

The best of planning and management resulting in soil developed to a high state of fertility will be of little use if poor seed or plants are secured. Perhaps no one thing is more essential to a successful crop than securing good seeds or plants from good seed stock.

Several methods of raising seedlings are employed, each having its advantages or disadvantages as the case may be.

Perhaps the most common is to raise the plants in prepared seed-beds. Congregated thus the seedlings can, of course, be more easily sprayed and watered than is possible when the seed is sown in the field. It is vital that the plants be kept disease-free and vigorous. Tomatoes are very liable to soil troubles, such as nematodes and fusarium wilt, therefore seed-beds should always be made on new soil. If necessary, the soil should be sterilized by one of the recognised methods prior to planting.

Various ways of sterilizing soil, such as with formalin and cheshunt compound may be employed. For the average farmer probably the simplest and most efficient is to apply intense heat to the soil prior to sowing the seed, and the following extract, taken from the departmental pamphlet "Tobacco Growing in Queensland," explains this fully.

"Before further preparing the seed-beds for sowing, the soil should be sterilized. There are several methods of doing this, such as by steaming, the application of boiling water, solutions of formalin or similar agents, but the most effective in general estimation and recommended for Queensland growers is by the application of direct heat from the firing of tree branches, brushwood, or similar heat-giving material, piled on the beds to such an extent as will, when fired, produce sufficient heat in the soil to cook a 4-oz. potato buried 3 inches deep, or an egg buried 5 inches deep. It is difficult to state the exact amount of material for burning purposes, but the equivalent of poles 3 inches in diameter laid side by side is regarded as likely to prove satisfactory. Successful sterilization of the soil is most readily accomplished when the amount of moisture therein is what is regarded as satisfactory for cultural operations. Excess of moisture is as undesirable as a deficiency, since in either case the penetration of the desired heat in the soil is less easily permitted.

"Properly burnt beds show a more or less reddish tinge of colour, while the soil is rendered more friable and breaks easily to a fine powder. The object of burning the beds as well as the soil for a couple of feet surrounding them is to destroy any fungus spores, weed seeds, insect or other life therein, that may cause damage to the young plants.

Time to Burn.

"The time to burn the seed-bed is preferably a few days or a week before it is desired to sow the seed.

Final Preparation.

"After the fire has burnt out and the soil has become sufficiently cool, all unburnt pieces of wood and large charcoal should be removed, and the beds and paths, disarranged when placing the firing material thereon, trimmed up to proper shape. The fine ashes from the firing should now be thoroughly incorporated with the soil of the seed-beds, which at the same time should be reduced to the desired degree of fineness by digging and raking, back and forth, to a depth of 3 inches and finally levelled off."

It is not a wise policy to raise seedlings twice in succession in the same bed. Seed-beds should be made in a sheltered position, open to the sun, well dug, and cultivated to a fine tilth. The surface texture should be fine, smooth, and reasonably firm. If the soil is very loose the surface will rapidly dry out and the germinating seed suffer as a consequence. The beds should be thoroughly moistened prior to planting the seed, thereby minimising the amount of watering necessary until the seedlings are showing above the surface of the bed. The seed should be sprinkled upon the slightly-firmed surface and covered lightly with sifted sandy loam, and this gently firmed by light pressure with a flat board. Some growers then apply a light covering of dry straw, stating that such action assists germination. It would certainly help to keep the beds damp. Should this be done, a careful watch must be kept and the straw removed immediately the tiny seedlings appear above the ground. Only in extreme instances is artificial shade necessary. Subsequent treatment is to water the beds when necessary, and to spray the young plants with Bordeaux mixture at regular intervals in order to keep the young growth covered. Most growers transplant when the young seedlings are from 6 to 8 inches high.

In most instances sowing of seed should be made during April and May, if it is desired to market late winter and early spring crop. In districts where frost or cold winds are not a menace, and where irrigation is available, the sowing of seed can be made at almost any time. This, of course, is only practised where conditions are suitable to allow as nearly as practicable for a continuity of the harvest of the fruit. Normally six weeks should lapse between the sowing of the seed and the planting out of the seedlings.

Before setting the plants in the field it is essential that they be subjected to the process of "hardening off," which is brought about by gradually withholding water for a week or ten days before transplanting. Through this action the plants will tend to become tougher. This somewhat hardened growth is better able to withstand possible chilling temperatures, drying winds, shortage of water, bright burning sunlight, and the shock of transplanting.

Immediately prior to transplanting, the beds should have a good watering and the plants should be removed during the ensuing two or three hours. They must be kept moist and fresh whilst the planting proceeds. All leaves, except the undeveloped crown leaves, should be pinched or cut off to minimise transpiration until the root system is re-established. The best method of planting is to dibble the holes and water in each plant. The plants should be set as nearly as possible at a depth ranging from 3 to 6 inches, according to the size of the seedlings. Transplanting provides an opportunity for the selection of the best plants and for the discarding of the small, spindly, or malformed ones. Only the best should be used. A well-grown plant is an important factor towards a profitable crop.

A second method of planting tomatoes is to sow three or four seeds direct in the field at distances and in rows where the plants are to be grown. This is an improvement on the seed-bed method for the reason that there are no broken roots to give ingress to fusarium wilt and no setback, as at transplanting time. However, sufficient rainfall is always necessary to make satisfactory germination and growth. Attack from cutworms must also be guarded against, but if the grower can overcome these disadvantages then planting direct in the field has many points to recommend it. With a good strike some thinning is necessary.

Possibly the most efficient method of all for the grower who will take pains to eliminate every risk is to prepare tubes of bitumen roofing material and grow the seedlings in these. The procedure is as follows:—Wooden trays are constructed about 3 feet by 2 feet to hold the tubes. The tubes are made of pieces of bitumen roofing material rolled up and held together by a loop of string. One end should be plugged. The grower from whom this idea originated uses plugs cast in cement, but short pieces of round timber would do equally well. The tubes should be filled with compost and stood upright in the trays, and two or three seeds put in each.

The first advantage of this method is readily apparent, for the trays of seedlings can be kept clear of cutworms and other pests, and if necessary carried to shelter during inclement weather.

When the seedlings have produced their first rough leaves the trays are carried to the plot, a hole dibbled, the plug removed, the string cut, and the tube containing the plant planted in the hole and removed, leaving the plant with its roots quite undisturbed *in situ*. Eventually, one plant is left, the remainder being pinched out.

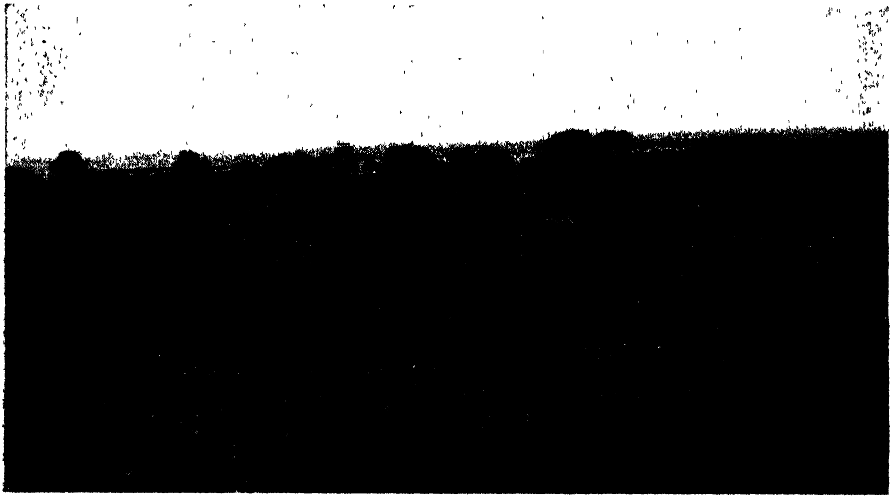


Plate 7.

A GROUND CROP, REDLAND BAY.—Note apparent difficulty in harvesting as compared with a staked or trellised crop.

The second advantage is that the seedlings can be planted out safely in any reasonable weather, since the roots suffer no disturbance, and, remaining unbroken, are less liable to be attacked by fungi. By the time of planting, the plants have also attained a fair size when they are exposed to the attacks in the field of cutworms, &c., and risk of loss from pests is less.

It is claimed that tomatoes grown by this method are several weeks ahead of those planted in the usual way. The trays, tubes, and plugs will all last for years, and, since most of the preparation can be done during odd moments or on wet days, there is really no extra trouble incurred. It is actually an adaptation of the gardener's practice of pricking out his seedlings into thumb pots preparatory to planting them out in the flower beds, and this can be recommended strongly.

An ounce of seed germinating 95 per cent. should produce approximately 2,000 plants.

PLANTING SYSTEM AND PRUNING.

One must differentiate between the methods used for obtaining a quick crop off newly burnt off scrub or lantana land and those followed by the established market gardeners. In the former the plants are usually set out 4 to 6 feet by 6 feet apart (approximately 2,000 plants to the

Plate 8.
AN IRRIGATION PIPE LINE.—A great advantage in successful tomato production.

acre), in the more or less uncultivated ground, and are allowed to spread, unpruned, over the land. The same practice is adopted by some growers working on ploughed tomato fields, but of recent years this policy has not been advocated especially upon land that is easily cultivated. The main objection is that the resulting crop may be anything from extremely good to a total failure, according to the weather and disease and pest incidence. Much fruit is often lost through slug and insect damage, or scalded from resting on the hot ground.

Plate 9.
TRELLISED SYSTEM.—Young plants midway between the lower and upper wires.

Plate 10.

STAKED TOMATOES.—Carrying a good crop. Note height of plants

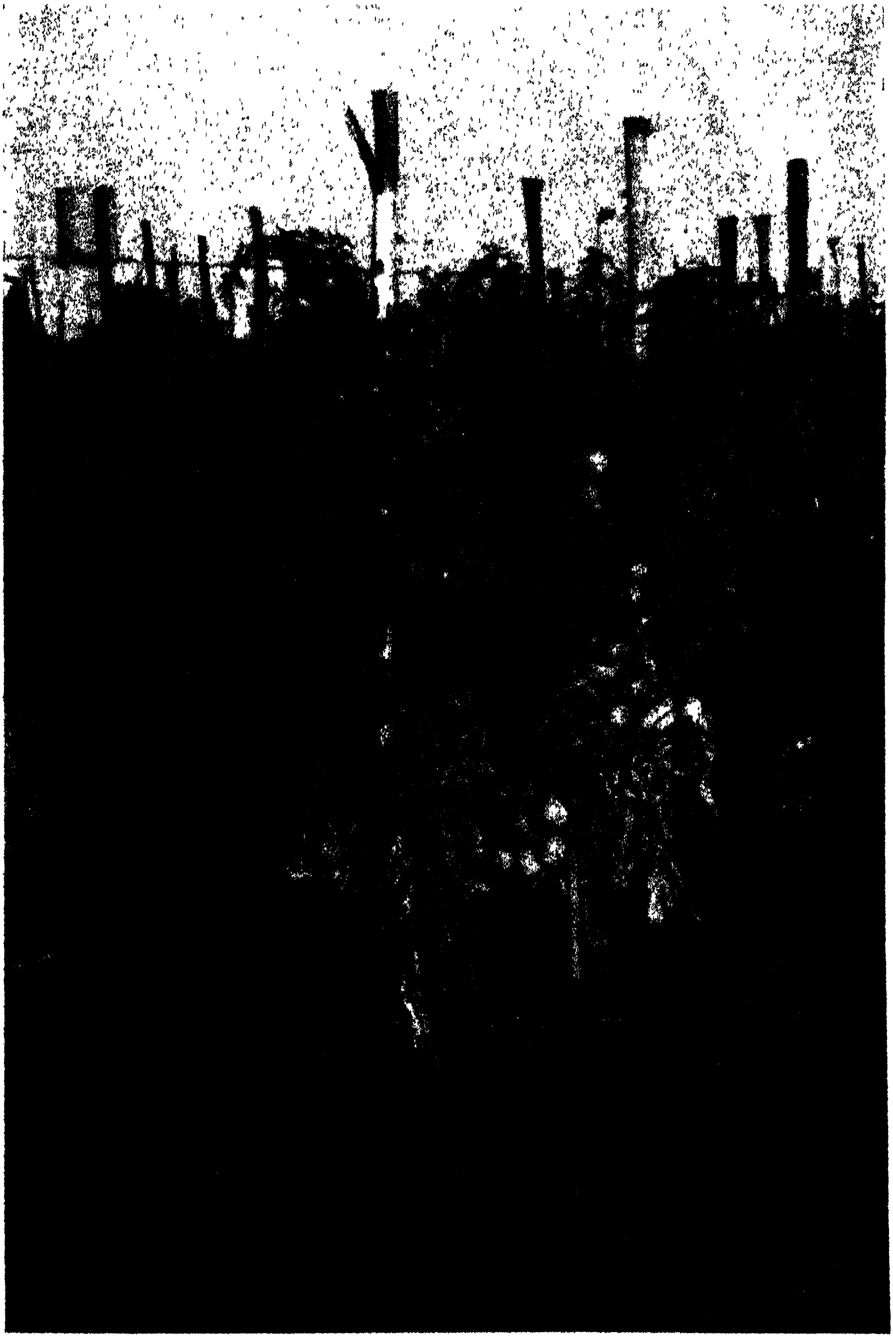


Plate 11.
Staked Break O'Day.—Showing a good crop.

Staking or trellising are both methods that have much to recommend them. Briefly, the system is as under:—

Staking.

Hardwood stakes are placed in rows 15 to 18 inches apart with 3 feet 6 inches to 4 feet between the rows. Each stake should be 5 to 6 feet in length, and when driven into the soil should retain a height of at least 4 feet. This allows for approximately 8,000 plants and a corresponding number of stakes to the acre. The plants are trained from the outset to single stems. All lateral growths are pinched out as soon after forming as possible. The leaves from whose axils they grow are, of course, left. The single stems are tied every 12 to 18 inches to the stake by strips of soft rag or binder twine. The ties are made loosely so as not to constrict the expanding stem and are positioned beneath a leaf. The actual action consists in passing the tying material round the plant stem immediately below a leaf, crossing it over itself, and then passing it round the stake twice before knotting, so that the plant is attached to the stake by the loops of a loosely-made figure eight. Finally, the growing tip is pinched out when the plant reaches the top of the stake.

Plate 12.
PICKING TOMATOES.—Advantage of trellis system.

Trellising.

One method of trellising is to set heavy hardwood posts firmly in the ground 4 feet apart at each end of the field. These are solidly stayed and bored to carry two plain wires of, say, 12 gauge. Good hardwood stakes bored and driven into the ground every 12 feet are all that are required for intermediate supports. The top wire is strained at about a 4 feet 6 inches height, whilst the lower is strained at approximately 1 foot from the ground. The young plants are set out beneath the lower wire, trained to two stems and enabled to reach the top wire by means of strands of binder twine tied in "V" fashion thus:—

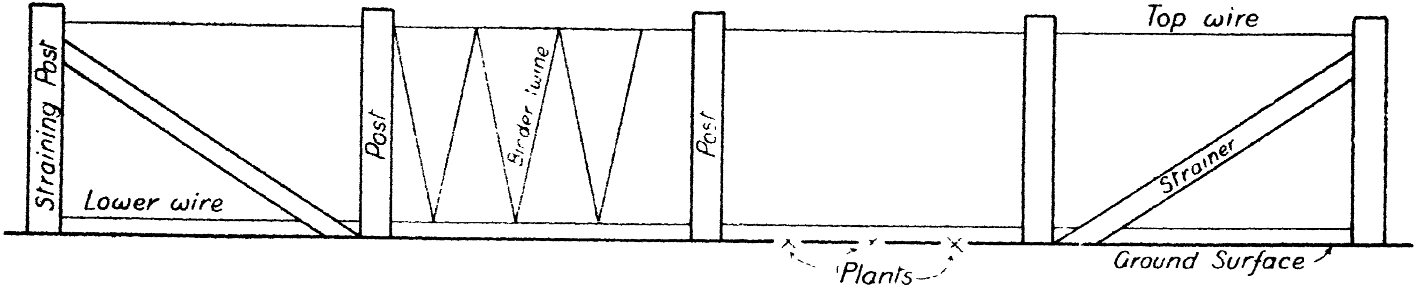


Plate 13.
Diagram showing material required and how to erect a trellis for tomatoes.

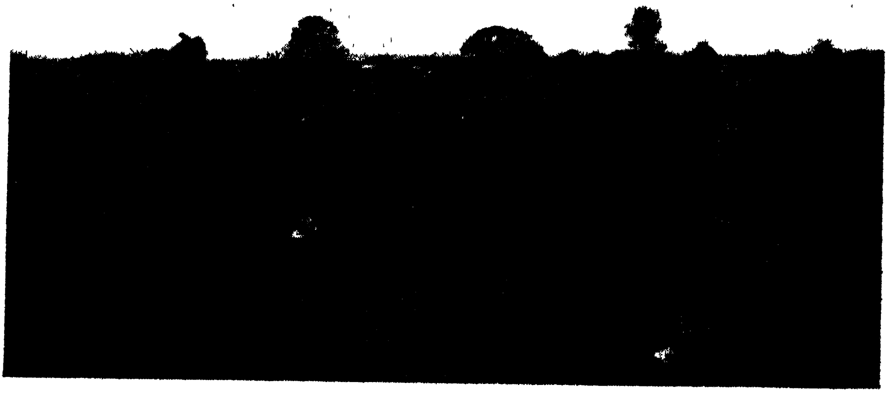


Plate 14.
TRELLISED SYSTEM.—Note position of strainers and distance between posts.

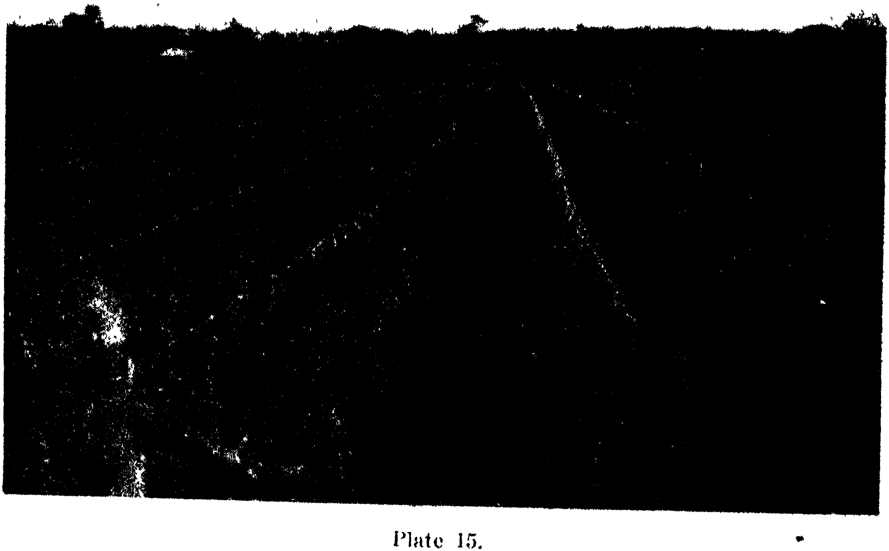


Plate 15.
A GENERAL VIEW OF A TRELLISED FIELD.—The first pick had been taken from this crop.

It is necessary to prune and eventually to pinch the head of the plant off as has been recommended in staking. The fruit produced by either of these methods is grown under the best possible conditions.

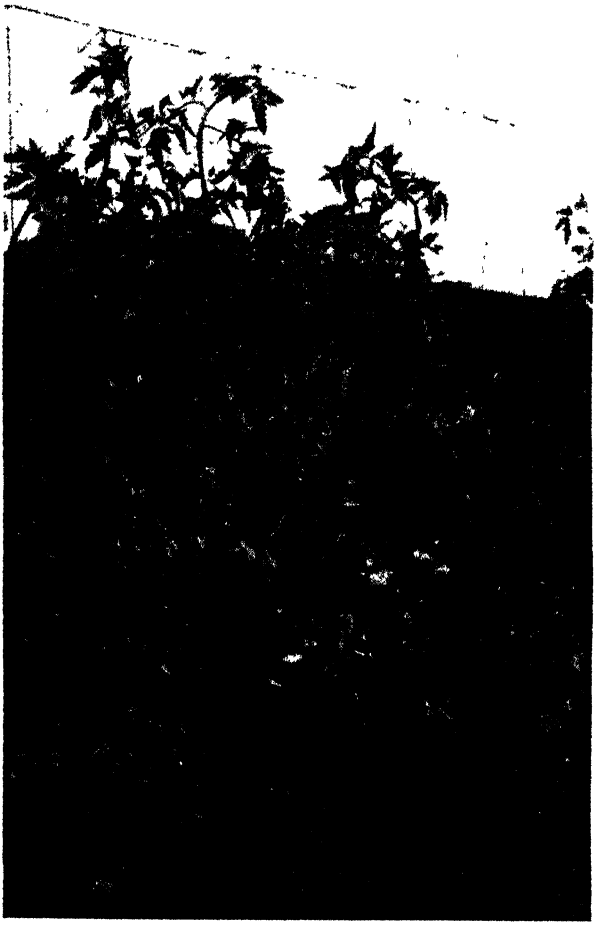


Plate 16.

A FINE SHOWING OF YOUNG FRUIT.—Note closeness of plants and height of growth.

Sprays and dusts for disease and pest control can be applied with greater economy and efficiency, the result being a high percentage of first quality fruit and a heavier crop. Cultivation also can be continued close to the plants, thereby conserving moisture and suppressing all objectionable weed growth. There is a minimum risk of damage to the fruit and the crop reaches maturity considerably in advance of fruit grown on plants unstaked or untrellised. Harvesting is quicker and more satisfactory, since the matured fruit ready to pick can be seen at a glance without having to pull the plants about. After the crop has been harvested, posts, stakes, and wiring can all be removed and stacked until required for erection on fresh land for the following season's planting.

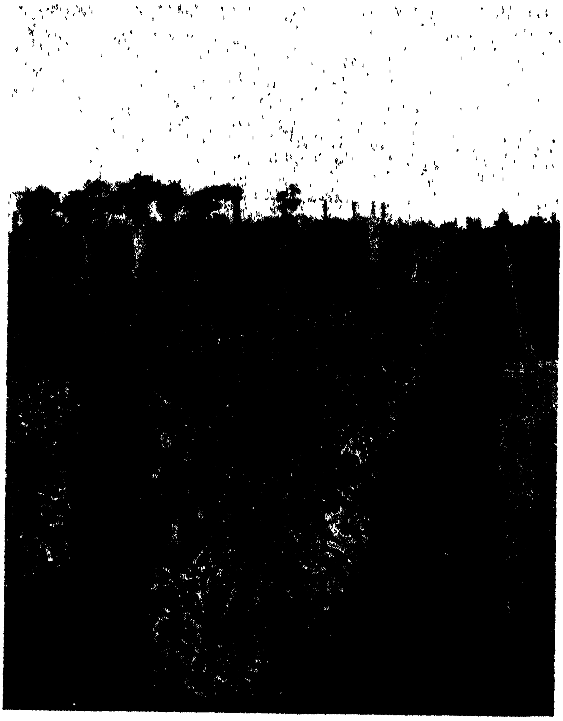


Plate 17.

TRELLISED TOMATOES.—Note spacing between rows.

FERTILIZING.

As mentioned previously the tomato does best in a soil of original medium fertility, but of good humus content. An excess of nitrogen such as is produced by very heavy dressings of stable manure alone tends to produce an abundance of succulent leaf growth at the expense of a satisfactory crop of fruit. This effect is neutralised by the application of from 150 to 300 lb. of a mixture consisting of 2½ parts of superphosphate to one of sulphate of potash per acre, which will definitely tend to check excessive vine growth, result in an earlier maturity of fruit, and materially increase the yields. It will be seen therefore that although the tomato requires a fertile soil, it is very sensitive to an unbalanced nutrient condition. On soils of moderate fertility a complete fertilizer, such as 4-12-12 or 4-16-12, applied at the rate of 300 to 500 lb. per acre should prove most beneficial. Such a formula as 4-12-12 is obtained by mixing together 420 lb. sulphate of ammonia, 700 lb. superphosphate, 560 lb. bonedust, and 560 lb. sulphate of potash, thus making 1 ton of fertilizer. The formula 4-16-12 would require a greater amount of superphosphate. (The chief fertilizer firms supply ready mixed fertilizer to these formulæ.) The fertilizer should be applied in the row and mixed well with the soil before setting the plants. Where very heavy applications are necessary, the fertilizer should be applied at the side of the row or broadcast, the purpose of this being to avoid injury to the roots and stems of the newly-planted seedlings. A side dressing of from 50 to

100 lb. of sulphate of ammonia or nitrate of soda applied one month after transplanting is often beneficial. The method of application is to open furrows about 2 or 3 inches deep on both sides of the rows, about 9 to 12 inches from the plants, and apply the fertilizer along these small furrows which should then be covered in with loose friable soil. Top-dressing with from 75 to 100 lb. per acre of water-soluble inorganic fertilizer, made up on a 4-11-10 formula, is practised with beneficial results under certain conditions. Such a formula is obtained by mixing together 490 lb. sulphate of ammonia, 1,265 lb. superphosphate, and 485 lb. sulphate of potash, making 1 ton. In average soils the application of lime to tomato ground does not seem directly to benefit the tomato crop, but is often indirectly beneficial as a result of its effect on other crops planted in rotation.

Plate 18.

A fine crop of trellised and irrigated tomatoes, Redland Bay.

It must always be remembered that the humus content of the soil must be kept up and rotating the land with a green crop appears to be the most satisfactory method to adopt. In considering this, regard to nematode control arises, for, unfortunately, the tomato is highly susceptible to these soil animals, and most of our areas devoted to market gardening are infested to a varying degree. A non-susceptible green crop is, therefore, most desirable and *Crotalaria goreensis* can be recommended for such purposes.

VARIETIES.

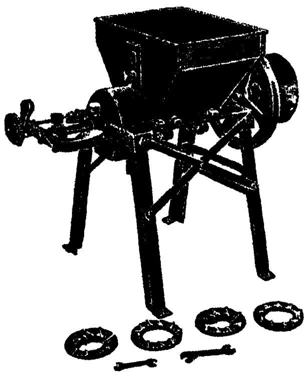
Every tomato grower should keep himself well informed in regard to varieties. Constant attempts are being made by individual growers and through departmental experiments to improve tomato varieties and to develop new and better types, the results sometimes being satisfactory. Considering such facts, a selection for Queensland home gardens could be made from the following:—Earliana, Bonnie Best, Break O' Day,

Plate 19.
The tomato packer at work.

FARMERS

Winter is at hand, and, owing to the drought conditions prevailing, Fodder is scarce. Make the best use of what you have by purchasing a Sunfeed Grinding Mill which will grind all classes of grain, and will grind maize, and also the maize and cob together, to various texture of meals to suit your requirements. When ground by the Sunfeed, the feed value is immensely increased and will go much further.

Cows produce more milk, and pigs grow faster, when the grain is fed in the form of meals.



PRICE OF GRINDER, as illustrated, **£9 12s. 6d.** F.O.R. Brisbane.

Terms.—Half Cash, balance twelve months, or less a discount of 2½ per cent. for all Cash on Delivery.

Coarse grinding can be done with a 2 h.p. Sundial Engine, or for grinding fine meal a 4 h.p. is required.

For further particulars of this and all other lines of Farm Implements, see the Local Agent or write for leaflet to

H. V. McKay Massey Harris (Qld.) Pty. Ltd.
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Just on your left after crossing Victoria Bridge.

Banana Growers!

Stop Squirter and keep down Blackend damage by using

SHIRLAN A.G.

Recent research work by officers of the Queensland Department of Agriculture has demonstrated the great value and reliability of SHIRLAN A.G. for the control of these serious banana troubles. It is recommended that during the Winter and early Summer months, fruit be dipped in a 1 per cent. solution of Shirlan A.G.

EASY AND CHEAP TO USE

The treatment is simple, inexpensive, and effective. We are the Queensland distributors of Shirlan A.G., and will be happy to send you full particulars of the use of this material, also prices. Address your enquiry to—

A.C.F. & SHIRLEYS FERTILIZERS LTD.
LITTLE ROMA STREET, BRISBANE

PARATOX BLOW FLY OIL

A scientifically prepared dressing containing only finest and most effective ingredients. Kills larvae, repels fly, heals and soothes the sheep, does not harm wool and will not wash off in rain. CONTAINS NO ARSENIC.

KREOLA SHEEP DIP

A reliable and relatively non-poisonous liquid phenolic dip containing 20% Tar Acids recovered from selected Tar Distillates. Destroys lice, ticks and other parasites, prevents scab, affords protection from the fly and provides a healthy, luxuriant growth of wool.

PARATOX B. SHEEP DIP

A companion product to Paratox Blow Fly Oil. Completely removes and destroys Ticks and Lice, leaving wool in clean and healthy condition. Soothing to beast and does not harm wool. CONTAINS NO ARSENIC.

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and Every Clerk of Petty Sessions.

Marglobe, and Ponderosa. A good list for the market gardener could be selected from the following, which are placed in order of maturity:—

Early Varieties: Earliana, Earliwinner, Kondine Red, Bonnie Best, Break O' Day, June Pink, and Chalk's Early Jewel.

Mid Season: Marglobe, Burwood Prize, Improved Stone, Bowen Buckeye, Norton, and Red Marhio.

Late Varieties: Targinnie Blue, Ponderosa, and Australian Large Red.

The following varieties are of wilt resistant strain:—Break O' Day, Marglobe, Red Marhio, Bowen Buckeye, and Norton. Much has been said in favour of wilt resistant varieties, and in districts subject to wilt damage more extensive plantings of these varieties could be recommended.

Between the earliest and the latest maturing varieties in the one season would be a difference of approximately thirty days, i.e., if all plants were planted on the same date. Earliana is one of the quickest to mature, whilst Ponderosa usually takes the longest of the recognised commercial varieties.

PESTS AND DISEASES.

In Queensland the main diseases affecting tomatoes are:—Irish blight, fusarium wilt, bacterial canker, target spot, septoria leaf spot, blossom-end rot, and the virus diseases spotted wilt, mosaic, and big bud, whilst the more important pests of tomatoes include cutworms, corn-ear worm, green vegetable bug, Rutherglen bug, tomato mites, and nematodes.

Information regarding these and other pests and diseases is obtainable from officers of the Division of Entomology and Plant Pathology, Department of Agriculture and Stock, at Brisbane, Stanthorpe, Toowoomba, Nambour, Rockhampton, and Atherton.

QUEENSLAND SHOW DATES FOR 1937.

July.

Nambour—	
Show	15th and 16th
Campdraft	17th
Esk	16th and 17th
Charters Towers	20th to 22nd
Laidley	21st and 22nd
Maleny	22nd and 23rd
Cairns	27th to 29th
Gatton	28th and 29th
Barcaldine	28th and 29th
Emerald	28th and 29th
Caboolture	30th and 31st

August.

Crow's Nest	4th and 5th
Home Hill	6th and 7th
Royal National, Brisbane	16th to 21st
Wynnum	27th and 28th

September.

Imbil	3rd and 4th
Ingham	3rd and 4th
Pomona	10th and 11th
Tully	10th and 11th
Rocklea	11th
Innisfail	17th and 18th
Malanda	22nd and 23rd

October.

Ravenshoe	8th and 9th
Millaa Millaa	1st and 2nd

November.

Murwillumbah	3rd and 4th

Green Manuring the Orchard.

R. L. PREST, Instructor in Fruit Culture.

MUCH has been said and written by agricultural experts throughout the world on the subject of green manuring generally in the orchards and the field; but, although the more progressive growers have adopted this annual practice, it is unfortunate that many have failed to realise how necessary it is to the success and longevity of their orchards.

By green manuring is meant the growing of suitable green crops in the orchard to be turned under to rot down as humus, and by this means improve the soil texture and assist in maintaining fertility. Growers will more readily appreciate the importance of this practice, when it is recognised that humus, the product of the decay of organic substances, is one of the most important ingredients in any fertile soil, and, generally speaking, is only present in inadequate amounts in most of the soils in our citrus growing areas.

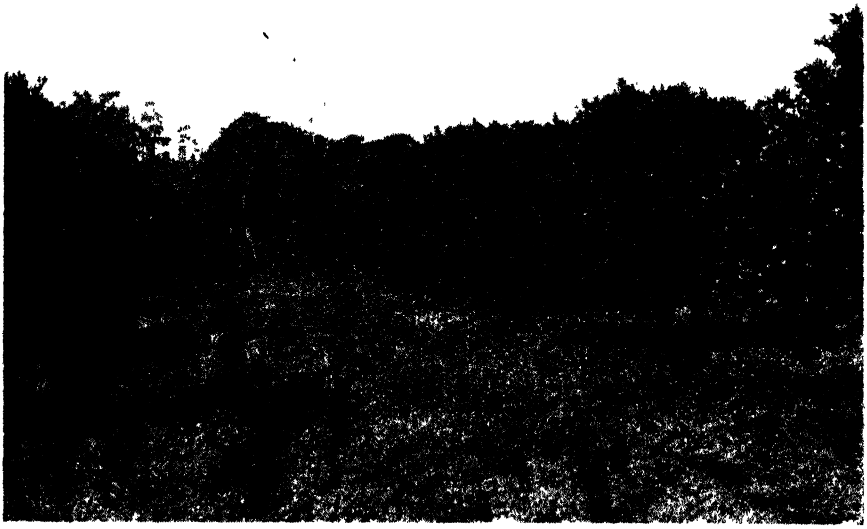

Plate 20.

Winter Green manure crop of young Lupins in the Citrus plantation.

Except in alluvial lands, periodically improved in fertility by flooding, the orchardist must consider the maintenance and improvement of the soil fertility if he wishes to harvest good crops. The application alone of artificial manures is of little value, when not supported by soil humus. Where animal manures are available, their incorporation with the soil is most desirable; but, in the absence of bulky, organic farmyard manure, the maintenance and improvement of soil fertility may be carried out by growing and turning under green manure crops. Apart from building up the physical condition of the soil, their growth during the rainy season reduces soil losses by erosion.

By the ploughing under of some succulent rapid-growing green-manure crop, the soil is enriched by the addition of certain essential plant foods. The carbon, oxygen, and hydrogen of plants come largely from the air, and the turning under of a crop, therefore, increases the store of such elements in the soil. The compounds that result from the crop decay increase the absorptive power of the soil and promote aeration, drainage and granulation—conditions of importance where successful plant growth is concerned. If the crop turned under is a legume, and the nodule organisms are active, the store of soil nitrogen is increased.

Plate 21.

New Zealand Lupin—Note root nodules.

Green-manure crops may also function as a cover crop, in so far as they take up the extremely soluble plant foods and prevent their loss in the drainage water. Green-manure crops, especially those with deep roots, absorb plant food from a great depth, and when the crop is turned under, this material is deposited in a more available form nearer the tree root zone.

When planning the growth of green-manure crops, care should be taken to avoid, as far as possible, their competition with the trees for soil moisture, particularly during the active period of tree growth and fruit development. Under no consideration should trees be permitted to suffer from lack of moisture.

In coastal orchards the general practice should be to utilise the summer rains. By planting about late November, a good germination may usually be obtained, since, under ordinary weather conditions, November is showery. The crop may then be permitted to grow until about the end of February, which period will cover the rainy season, ensuring a good bulk for turning under, and incidentally checking soil erosion.

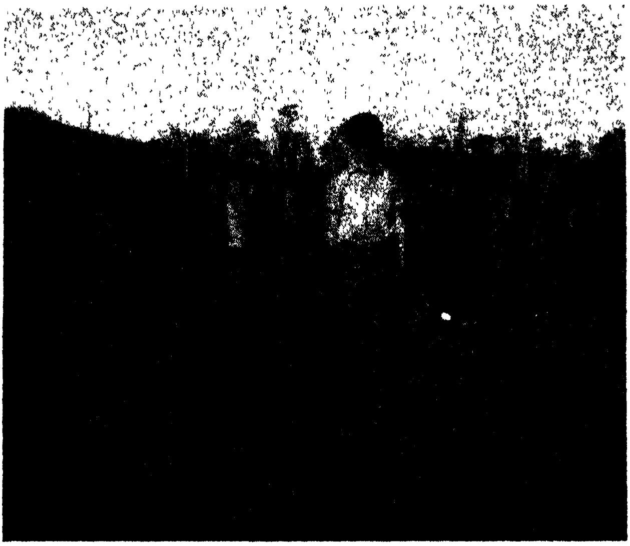

Plate 22.

Reconditioning Passion Vine soils. Green-manure crop of Mustard ready for turning under.

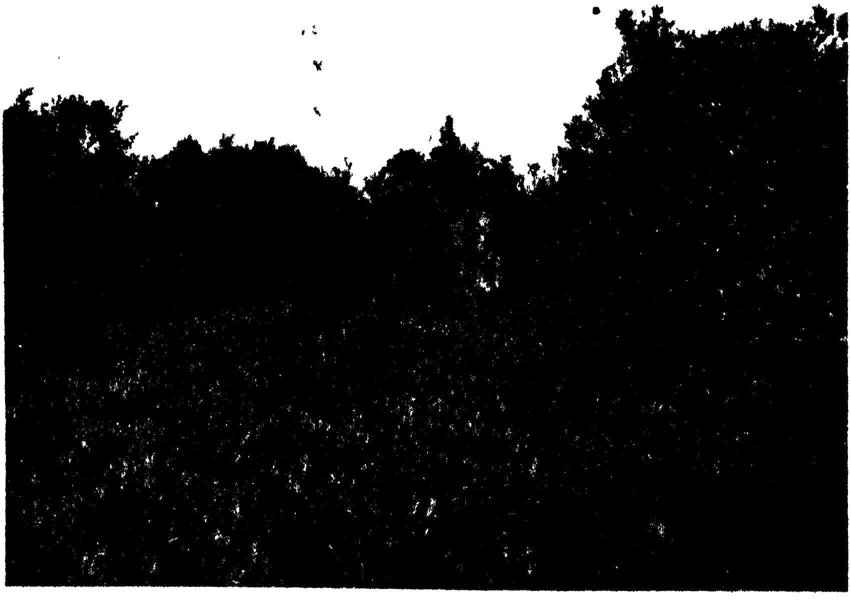

Plate 23.

Winter Green-manure crop of Field Peas and Skinless Barley in a Citrus plantation.

The districts in which irrigation facilities are available, or where autumn and late rains are seasonable, will be best served by planting late autumn and winter green-manure crops. Such crops, however, should not be permitted to grow over into the active spring period.

In newly planted orchards, trees up to four or five years of age seldom occupy more than a relatively small proportion of the total area upon which they have been planted. This factor may be early utilised to build up a reserve of vegetable matter in the soil by thickly interplanting cover crops up to four or five years. The tree roots do not extend far from the trunk and do not take up the amount of space occupied by those of older established trees. Thus cultivation may be confined to the immediate vicinity of the trees; and by far the greater amount of space down the centre of the tree rows may be occupied in growing both summer and winter green crops. A strip along each side of the tree is thus being cultivated frequently.

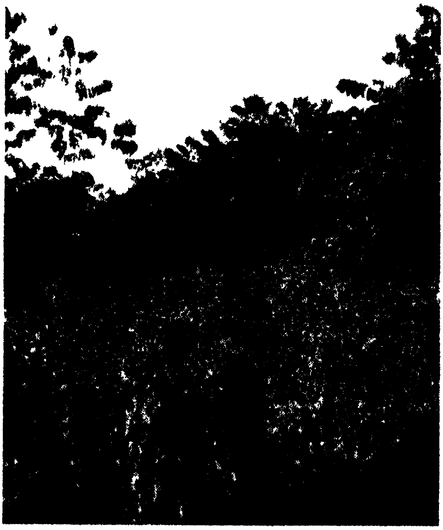

Plate 24.

Summer Green-manure crop of Crotalaria in a Custard Apple plantation.

The choice of the particular crop to grow will depend upon the season, the amount of water available, and the length of growing period available.

As the main essentials of a desirable green crop are rapid and succulent growth, it is of considerable benefit to apply a light dressing of fertiliser when sowing the crop. Both legumes and non-legumes will benefit considerably by the presence of phosphates in the early stages of growth, whilst in some soils nitrogen as well as phosphates may be required to produce good growth.

Though as yet the most desirable plant to use as a green-manure crop has not been found, there are at least two or three that have proved satisfactory for summer crops. Planted during November and December as seasonal conditions permit, Crotalaria, Poona Pea, and Black Cowpea have done well, particularly where sown with superphosphate. The addition of one to two hundredweight of superphosphate per acre at seeding will be found to give excellent results. On poor and exhausted soils, the addition of a little sulphate of ammonia or nitrate of soda at the rate of ½ cwt. to the acre will be of material assistance to the cover crop.

Plate 25.

Reconditioning Pineapple soils. Green manure crop of Maize ready for turning under

Under normal conditions these plants will have made satisfactory growth and produced a good body of succulent tops for turning under during March and April.

For the winter green-manure crop, field peas and barley, tick beans, mustard, and in some districts lupins and vetches have proved satisfactory.

Planted in March, good bodies of material have been ready for turning under in June. Here again, except perhaps in practically virgin soils, it is very desirable that a suitable fertiliser be used at planting to ensure quick growing and succulent plants.

◆

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Some Tropical Fruits.

No. 15 THE MABOLO.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE Mabolo is a member of the Order Ebenaceae, or Ebony family, and is closely related to the Sapotaceous fruits. The tree is slow growing and takes many years to reach its ultimate height of about 30 feet. Its chief value lies in its ornamental appearance rather than in its fruit production, for although the tree crops heavily the fruit is of mediocre quality.

The native habitat of the mabolo is the Philippine Islands and the East Indies. Outside these countries it is only infrequently met with, usually planted as a specimen in tropical fruit gardens or parks. Specimens in Queensland are very limited in number.

Plate 26.

A three-year-old Mabolo Seedling, illustrating the slow growth.

The tree is usually raised from seed which germinate readily enough in loamy sand. The growth of seedlings is very slow and it takes a considerable time for the plants to reach a suitable size for planting in the field.

The foliage of this plant is distinctive in that, while the upper surface of the leaves is dark-green and glossy, the under surface is of a greyish colour and heavily pubescent. The leaves are of fair size, being 8 to 10 inches long by 3 to 4 inches wide, and are borne laterally along the smaller growths. During September flower buds are produced in all the leaf axils of the season's lateral growths, the flowers being directed downwards beneath the leaves. The flower has a cumbersome appearance with its four strongly recurved fleshy, cream-coloured petals opening out over a like number of large erect sepals. Only a comparatively small number of flowers produce fruit, but even so a heavy crop usually results. The fruit is undoubtedly of striking appearance. Shaped similarly to one of the flat type of persimmon, it retains the sepals throughout its growth as does its persimmon relative. The skin of the fruit is thickly covered with fine needle-like hairs, giving it a velvety appearance. The colour is rusty-brown tinged in the young fruit with green, but assuming a reddish hue when ripe. On cutting the ripe fruit across it will be seen that it consists of a white mealy flesh covered by a thin skin. The star-shaped disposition of the seed cavities which is characteristic in sapotaceous fruits, is retained in this fruit also. The first taste of the fruit does not create a favourable impression and further acquaintance with it only modifies that impression in a small degree. The fruit cannot even be classed as of fair quality. A peculiarity the fruit shares with quite a number of tropical fruits is the remarkably strong scent of the ripe fruit. Although not unpleasant this scent becomes overpowering in a closed room. The ripening season

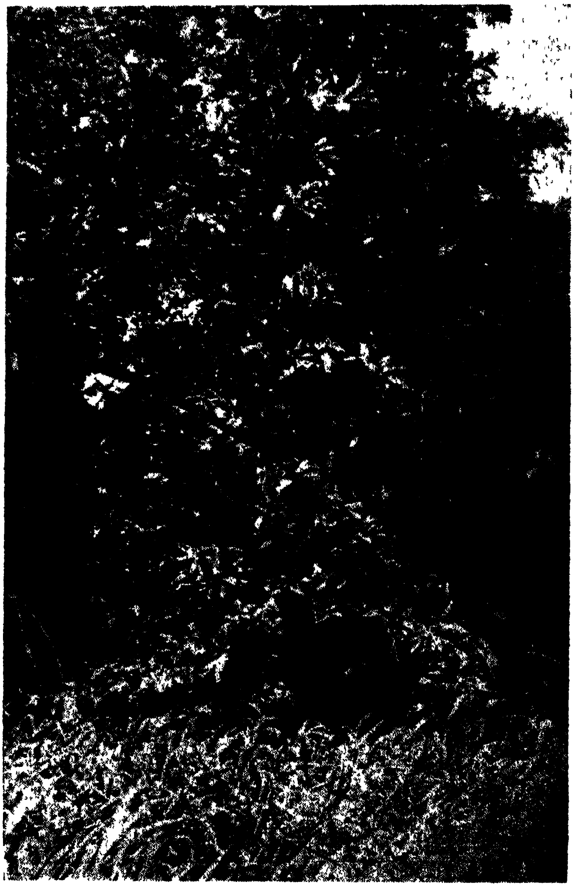

Plate 27.
A Mature Tree about Forty Years old.

in North Queensland is January to March, but odd ripe fruits will sometimes be found at other seasons.

In regard to soil for the mabolo, trees are growing well in the North on rich alluvial loam and fairly well on loamy sand kept well moistened.

The fruit-sucking moth is very partial to this fruit which it sucks out, leaving only a spongy mass. Fruit fly also attacks it readily.

Plate 28.
The Mabolo Fruit.

Several common names are applied to this fruit. In its native habitat Mabolo is the common name. In other places it is called "Velvet apple" (from the velvety appearance of the fruit), and "Butter fruit" (probably in allusion to the buttery consistency of the mealy flesh). Botanically it is known as Diospyros discolor.

Efforts to propagate the tree vegetatively have been made in the Philippine Islands by P. J. Webster, who found that shield budding may be successfully practised. Unless better varieties exist in that country than we have in Queensland, however, such propagation of this fruit would be hardly worth while.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE advent of the cold weather has affected the values of many different fruits on the various markets, particularly bananas and citrus. With the shortage of supplies, however, this should be only of a temporary nature.

Growers who have shown a tendency to harvest fruit before it is actually ready, so that they could avail themselves of the high prices prevailing, will now cease their efforts in this direction, and consequently the quality of winter fruit should be enhanced from the consumer's point of view.

Complaints are still received about the marketing of green papaws. This fruit is only now becoming known to the Southern people, and at this juncture, whilst the market is being developed, it would be best to send only first quality fruit. Many hundreds of tourists travel from the Southern States to Cairns, where at this period of the year first quality fruit is obtainable, and these people, returning to the South with a taste developed for tropical fruits, are naturally disappointed if they are sold a poor quality fruit.

A similar situation exists in respect to custard apples, many growers in the past having spoiled the market by sending in immature fruit. The development of a taste and outlet for tropical fruits will be a slow process, but to this State should more than repay the work entailed. Queensland has a monopoly in the production of these fruits, so that any expansion of markets must benefit only the growers of this State.

The following is a summary of the market prices obtaining during the month:—

TROPICAL FRUITS.

Bananas.

Melbourne prices for cased fruit were as follows: Eights and Nines, 18s. to 19s., Sevens 16s. to 17s., Sixes 14s. to 15s. On the Sydney market the continued cold weather during June caused a considerable drop in prices, so that Eights and Nines sold at from 15s. to 18s., Sevens 13s. to 16s., and Sixes 10s. to 14s. In Brisbane Eights and Nines brought 13s. 3d. to 16s. 6d., Sevens 12s. 9d. to 15s. 9d., and Sixes 9s. 3d. to 14s. 3d., while Lady's Fingers sold at from 3d. to 6½d. per dozen.

The returns for the bushel case consignments sent to the Melbourne market were very satisfactory, comparing favourably with those obtained for similar fruit in tropical cases. Unfortunately for the experimental consignments, many growers despatched fruit to the Sydney market. This was not desired at the time, and it was not surprising that returns were definitely unsatisfactory. At a conference held at Murwillumbah it was decided that marketing bananas in clusters and in the bushel case be optional, the regulations, as at present gazetted, being applicable.

Pineapples.

Complaints regarding the marketing of green fruit are still being received; in their own interests growers should remember that winter conditions are now prevailing, and send only mature fruit.

Smoothleaf pines in Melbourne brought from 9s. to 12s. per case, and in Sydney 8s. to 13s. per case. Brisbane prices were from 4s. 6d. to 8s. per case, or for loose fruit from 2s. to 6s. per dozen. Roughs realised from 3s. to 6s. per case in Brisbane, and from 1s. to 4s. per dozen loose.

Custard Apples.

Market prices ranged as follows: Melbourne 4s. to 6s., Sydney 2s to 5s., and Brisbane 2s. to 3s. per half bushel.

Papaws.

Melbourne prices were from 14s. to 18s., and Sydney prices from 16s. to 20s. per tropical case. In Brisbane Yarwun fruit realised from 9s. to 11s. per tropical case; Gunalda fruit from 6s. 6d. to 7s. per bushel; and local fruit from 4s. to 6s. per bushel, with specials to 7s.

Avocados.

In Melbourne avocados sold at from 12s. to 14s. per case, and in Brisbane choice lines at from 8s. to 9s.

Granadillas.

Supplies were generally light, from 6s. to 10s. per dozen being obtained for prime large fruit.

Passion Fruit.

Sydney prices ranged from 8s. to 12s. per half-bushel case, and Brisbane prices from 4s. to 6s. for second grade fruit; from 7s to 8s. for first grade, and specials higher.

CITRUS FRUITS.

Oranges have maintained values at a steady rate. Mandarins slumped for a few days at the end of May, but have again reached higher levels and should now maintain prices. Queensland grapefruit of first quality has sold at high rates in Melbourne and Sydney, but the taste for this fruit on the part of the Brisbane public appears to require more development, as the demand at present is not great

Oranges.

In Brisbane commons realised from 6s. to 8s. per bushel, with specials to 9s., while Benyenda fruit sold at from 8s. to 10s. and Gayndah from 7s. to 9s. 6d.; Navels sold at from 8s. to 11s. per case. In Sydney from 6s. to 8s. per case was obtained for local Navels, and from 3s. to 7s. for commons.

Mandarins.

Brisbane prices were as follows: Local Glens 5s. to 10s., Gayndah Glens 8s. to 12s., Benyenda Glens 10s. to 12s., Fewtrells 4s. to 5s., Emperors 4s. to 9s., Scarlets 4s. to 7s. Sydney prices were from 6s. to 13s., and Melbourne from 9s. to 12s.

Grapefruit.

In Melbourne prices up to 16s. per bushel were obtained for Queensland Marsh Seedless, while in Brisbane from 6s. to 8s. per bushel was obtained for local fruit, and from 9s. to 11s. for Gayndah fruit.

Lemons.

Sydney prices ranging from 2s. to 8s. per bushel were realised, and in Brisbane from 10s. to 15s. for Gayndah fruit and from 7s. to 10s. for others.

DECIDUOUS FRUITS.

Practically all supplies of apples and pears are now being obtained from cold storage. Owing to the heavy supplies of fruit held in storage, growers with fruit in store are advised to spread their marketing over a period instead of endeavouring to beat the market with haphazard consignments.

Apples.

Stanthorpe Granny Smiths sold at from 8s. 6d. to 10s. 6d. per bushel case, and imported apples as follows: Jonathan 7s. to 10s., Cleopatra 5s. to 7s. 6d., French Crab 5s. to 7s., Granny Smith 6s. to 10s.

Pears.

Prices were as follows: Winter Cole 6s. to 13s., Winter Nelis 7s. to 10s., Packhams 6s. to 8s., Josephine 7s. to 9s., other varieties 7s. to 8s. per bushel.

OTHER FRUITS AND VEGETABLES.

Strawberries.

Brisbane prices ranged from 6s. to 10s. a dozen boxes, with choice berries from 13s. to 16s., and a few specials higher. In Sydney trays realised from 7s. to 9s. each, and boxes from 11s. to 15s. per dozen.

Cape Gooseberries.

The Brisbane price was from 6d. to 7d. per lb.

Tomatoes.

In Brisbane ripe tomatoes sold at from 1s. to 3s. per half-bushel, green from 1s. 6d. to 3s., and coloured from 2s. to 5s. Small fruit is not popular. In Melbourne Queensland fruit realised from 3s. to 5s.

Cucumbers.

Prices realised in Sydney were from 2s. to 5s. per case, and in Brisbane from 4s. to 5s.

Other Vegetables.

Brisbane prices for beans were from 9s. to 12s. per bag, for peas 8s. to 11s. per bag, and for lettuce 6d. to 1s. 3d. per dozen.

PUBLICATIONS.

A booklet on strawberry packing will be available for distribution shortly.

COTTON.

The combination of killing frosts occurring in most districts around the 19th of May, and the bright windy weather prevailing through June, has hastened the opening of the crops. The completion of harvesting is therefore well under way in all districts, for, as a rule, only a very light top crop has been produced. The volume of cotton arriving at the two ginneries still continues at a substantial rate, however, and it would appear that a slightly higher total will be obtained than appeared likely at the end of May. The quality and grades of the average cotton being received still are remarkably good considering the season.

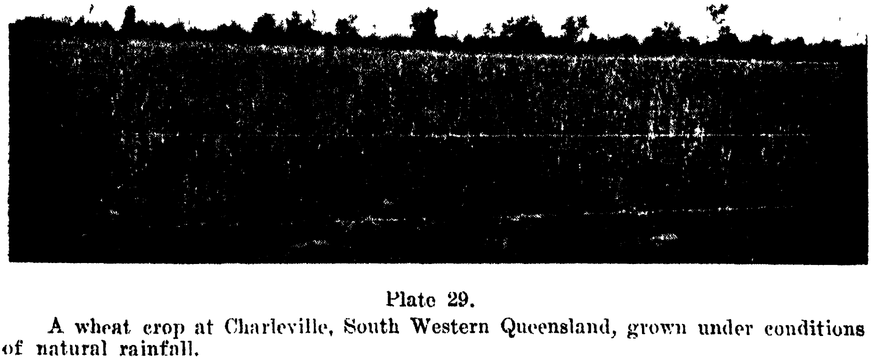

Plate 29.

A wheat crop at Charleville, South Western Queensland, grown under conditions of natural rainfall.

SUGAR.

Weather conditions for the first part of the month were uniformly dry, with relieving showers in central and northern areas. Cold droughty conditions have prevailed in the southern part of the State.

Practically all northern mills have now commenced crushing with reasonably good sugar content of cane. Dry weather and pest damage have considerably reduced crops in the central district, while the outlook for the current season in the southern part of the State is not good. Final estimates of crops have not yet been completed.

Plate 30.

A WESTERN WHEATFIELD.—A good crop grown under "dry farming" conditions, near Charleville.

USE CERTIFIED POTATO SEED.

The spring crop of potatoes in Queensland suffers considerably from the presence of virus diseases, including mosaic and leaf roll. These diseases are not always recognised by the potatogrower, who ascribes the abnormalities produced to a variety of causes The crinkling and slight mottling of the mosaic plant and the curling of the leaves in the leaf roll affected plant are often thought to be due to the action of dry weather or insect pests. Sometimes the abnormal plants are thought to belong to another variety of potato. Actually they are caused by virus diseases, which considerably reduce the yield. Sucking insects are responsible for the secondary spread of the diseases, but the principal loss is due to primary infection, which comes from the seed potatoes. The tubers from affected plants are numerous, but small, and as a result the yield is low in quantity and poor in quality.

The only practicable control measure for these diseases is the use of seed tubers free from virus. One cannot detect virus infection in the tubers, and the only means of ensuring that they are free is to examine personally the crop from which they are produced. Seed from potato crops, which have been regularly inspected and conform to certain required standards, is available at least in New South Wales. This seed, known as certified seed, commands a better price than the ordinary lines, but even a small improvement in crop value will more than repay any additional planting cost. A list of the available sources of certified seed may be obtained on application to the New South Wales Department of Agriculture.

R. B. Morwood.

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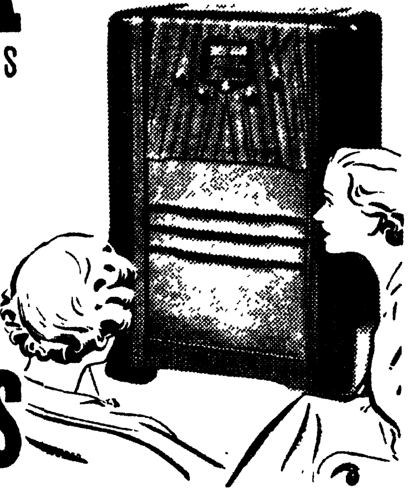

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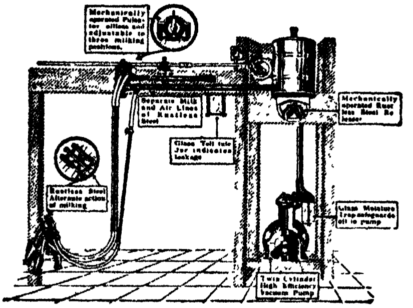
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ROOT CROPS FOR PIGS.

Successful pig raising depends largely on the production on the farm of suitable root crops. The crops should be fed to the pigs on the paddock system which permits the animals to do some of their own harvesting, and also suits their natural inclination to graze and search for roots.

Under normal seasonal conditions there are many root crops which possess a high food value and are more or less resistant to the immediate effects of dry weather.

Root crops recommended for pig feeding include sweet potatoes and English potatoes (after picking out the marketable potatoes, there always remain the small and broken tubers), Swede turnips, mangel wurzels, and several varieties of sugar beet. Arrowroot is worth consideration as a carry-over crop, while, in Central and North Queensland, varieties of cassava are worth cultivating in heavy types of soil which are less suitable for sweet potatoes. Of all these root crops, however, sweet potatoes are regarded by many pig farmers as the most useful.

In experiments conducted by the Department of Agriculture and Stock, Belgian field carrots gave results indicating that they are worth a trial. Onions are unsuitable for pig feeding. Jerusalem artichokes are not grown in Queensland to the extent that their importance as a pig food warrants. They are adapted to cultivation in a wide range of soils, although like sweet potatoes, they do best in a deep loamy or sandy soil rich in humus and with plenty of moisture.

E. J. Shelton.

Plate 31.

A maize crop grown for fodder at Charleville.

A CRUSH FOR CATTLE AND HORSES.

A crush for holding cattle or horses should be built on every farm. It costs little and occupies a small area; yet it saves much time and labour when adult stock are to be dehorned, branded, castrated, speyed, drenched, &c. For these operations the animal should be held in a position which allows of no movement.

The ordinary crush can be arranged to accommodate large or small animals. A series of auger holes (½ in. diameter) are bored about 6 inches apart along two rails of convenient height on each side of the crush. The holes should be deep enough to seat a bolt or iron pin firmly. The bolt or pin should stand 4 to 6 inches above the rail. These pins—one on each side—serve as chocks against which a cross rail may be placed. By working the animal right to the front of the crush, the pins and rails may be arranged to prevent any "backing." In a similar manner the width of the crush may be adjusted to prevent lateral movement.

To secure the head of the animal, the "A" shaped bail-type of structure may be made from a double cross rail between which slide vertical poles attached to the base of the crush posts by stout hinges. With such a crush many farm operations usually requiring four men can be done quickly and efficiently by a man and boy.

Plate 32.

"DRY FARMING" IN THE WEST.—A non-irrigated crop of Saccaline Sorghum, near Charleville.

FARM GATES.

Very little in the way of cultural operations is at present possible in many farming and dairying centres of the State, as a result of the adverse weather conditions. Nevertheless, on practically every holding there is quite a lot of work to be done, such as fencing repairs, the making and hanging of gates, the painting of buildings, and the overhauling of machinery, implements, and harness. Some of these jobs can be done during dry weather, and others are better reserved for rainy periods.

It is advisable to give attention to the outsibe jobs first and, of these, the erection and repair of gates is important. It is, indeed, surprising to find so many make-shift gates on the farm when strong light gates can be made or purchased at very reasonable prices.

Of the different types on the market, the wooden gates are the best, as those having a steel pipe frame, if once bent out of shape, are difficult to straighten, whereas a broken rail or two can readily be replaced. The self-opening types are favoured by some farmers, but these are more expensive and more liable to get out of order than the simpler kind.

Gates should always be swung independent of the fence, on good heavy posts placed 4 feet in the ground, with a sill log in between. The hinges, which should be strong, are generally placed in a vertical line. Occasionally, it is desirable that the foot of a gate should lift when opened, and this can be arranged by placing the lower hinge half an inch off the plumb in the opening direction.

The following materials are required to make a double five-barred bolted gate for a 12-foot opening without any morticing:—

112 running feet of 3-inch by 1-inch or 4-inch by 1-inch timber;
3 lb. of 3½-inch by ⅜-inch bolts and washers.
2 pairs hook and eye hinges 2 feet by 2 inch by $\frac{5}{16}$ inch.

Butts and heads should be cut 4 feet long, and should be double that is, placed on each side of the bars. The bottom of the first rail should be 3 inches from the bottom of the upright. The distance between the first and second rails should be 6 inches; between second and third, 6 inches; between third and fourth, 7 inches; and between fourth and fifth, 8 inches. There should be two double stays on either side of rails on each gate running from the bottom of the butt to the top of the head.

When hinges are being placed in position small pieces of 3-inch by 1-inch timber should be inserted against the rails for packing purposes. A sliding piece of 3-inch by 1-inch timber along the third rail between the stay and the head makes an excellent fastener.

Gates are not completed until they have been painted and if the first two coats are given before the gates are put together, a considerable amount of time will be saved.

R. E. Soutter.

Plate 33.
Sudan grass grown for hay on a property near Charleville.

PHOSPHATIC MANURES.

Three types of inorganic phosphates are available on the Queensland market—superphosphate, Nauru phosphate, and basic phosphate.

Nauru, or rock phosphate, comes from the Nauru and Ocean Islands where it occurs in enormous beds, as tricalcium phosphate, together with various impurities. The rock phosphate is mined and then ground down to very fine dimensions. A good sample would include 87 per cent. tricalcium phosphate, containing 39 per cent. phosphoric acid; 7·5 per cent. other salts and water; 5·5 per cent. impurities.

Superphosphate is manufactured from Nauru phosphate, the latter being first ground and then mixed with approximately an equal amount of sulphuric acid. By this means the insoluble rock phosphate is converted to the water soluble form in superphosphate. Cheaper grades of superphosphate than those marketed in Queensland are available, the prices varying with the water soluble phosphoric acid content of the fertilizer. Australian superphosphate is as high a grade as is sold anywhere.

Superphosphate contains 36 per cent. water soluble phosphate of lime (containing 20·5 per cent. water soluble phosphoric acid); 4 per cent. other phosphates; 48 per cent. other salts; and 12 per cent. moisture and impurities. A little free phosphoric acid is also present.

Purchasers of superphosphate sometimes come across some confusing terms in the trade description. The following are the more important:—

"20·5 per cent. phosphoric acid" is the amount of water soluble phosphoric acid;

"22 per cent. super" indicates the total phosphoric acid in both water soluble and insoluble forms;

"45 per cent. soluble phosphate" is a calculated figure obtained by converting the water soluble phosphoric acid to tricalcic phosphate—the insoluble form in which phosphates occur in Nauru phosphate and bone;

"48 per cent. tricalcic phosphate" describes the total phosphoric acid (soluble and insoluble) in terms of tricalcic phosphate.

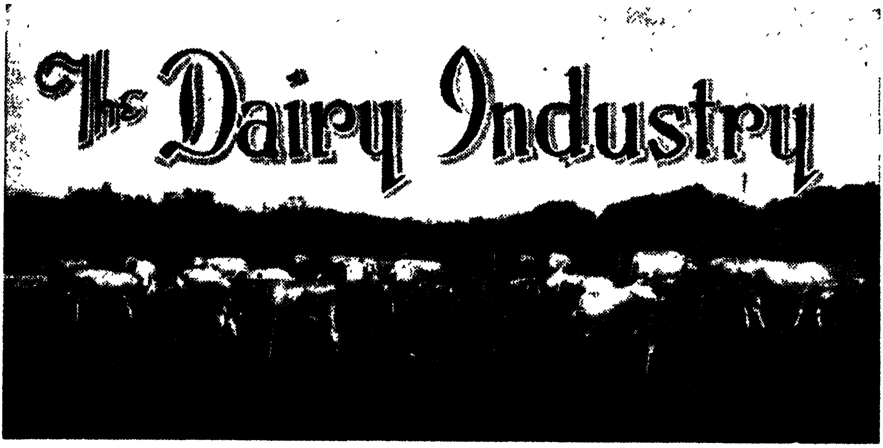
These descriptions may be applied to the superphosphate on the Queensland market, but the only useful figure for comparing different proprietary brands is "per cent. water soluble phosphoric acid." This is what the farmer intends to buy when purchasing superphosphates.

Queensland supplies are obtained from Port Kembla and Cockle Creek in New South Wales.

Basic phosphate is manufactured by mixing superphosphate with lime in varying proportions. The water soluble phosphoric acid is changed to the citrate soluble form.

Basic phosphate has a limited use in Queensland and is not included in mixed fertilizers.

F. B. Coleman.



Profitable Dairying.

MANY farmers consider that the more cows they milk, the more efficient and profitable their dairying activities become. There are, however, a number of other factors which must be considered in relation to dairy farm efficiency.

Matters under the farmers' control include pasture management, the quality of the milk or cream, and the incidence of disease in his herd. Good pasture management requires the introduction of the best grasses, rotational grazing, the conservation of fodder, pasture renovation, and the use of any necessary fertilizers. The quality of the milk or cream is largely controlled by the attention which is given to milking, separating, and storage of the milk on the farm, freedom of the pastures from tainting weeds, and the health of the herd. The incidence of disease in the herd depends to a very large extent on the care and attention given to the animals.

The milking capacity of the herd is dependent on that of the individual cows. Every herd contains animals which are less efficient producers than their companions, and these can only be detected by a regular system of herd testing. Once the unprofitable cows are detected, they should be immediately culled. Their offspring should also be regarded with suspicion, for in all probability they will have inherited undesirable characteristics of their dams. Only the more profitable cows in the herd, as determined by the herd tester, should be retained as breeders.

Farm management and the quality of the herd determine the efficiency of the dairy farm which can best be estimated on the yield of butter fat per acre. Good farm management and a poor herd are just as bad as a good herd and poor management. Good management and a good herd must result in a high yield per acre. Take, for example, the two following cases:—

Farmer A owns 200 acres of land and 50 cows which he bought cheaply at £3 per head from his neighbours. These he allowed to roam at will over his property. By this method he is able to maintain 1 cow on 4 acres of land. From this herd he obtains 7,500 lb of butter fat

(9,000 lb. of commercial butter) per year, equivalent to 150 lb. per cow. With butter fat at 1s. per lb. his gross income is £375. The yield of butter fat per acre is 37½ lb.

Farmer B owns an adjoining 60 acres. He adopted rotational grazing and other desirable practices and was able to maintain 1 cow on 3 acres. He bought 20 selected high-producing animals at £30 per head from which he obtains 6,000 lb. of butter fat per year, or 300 lb. per cow—just double that of his neighbour. His gross income is £300 or £75 less than his neighbour. The yield of butter fat per acre, however, is 100 lb., or nearly three times that of A.

Consideration of the factory returns misled A into believing that he is more efficient than B. An analysis of the finances, however, would show something like the following:—

	A £	B £
Capital invested in land (£15 per acre) ..	3,000	900
Capital invested in buildings and residence ..	900	900
Capital invested in fencing (B subdividing his smaller property) . ..	100	100
Capital invested in cows . . .	150	600
Total capital invested	4,150	2,500
Factory returns total	375	300
Working expenses (A at 5s. acre, B at 10s acre)	50	30
Net return	325	270
Net return per acre	£1 12 6	£4 10
Net percentage return on invested capital	7·8 p.c.	10·8 p.c.

L. A. Burgess.

PITTED BLUE GRASS.

A Pest in Coastal Pastures.

Pitted blue grass is very common, with a wide distribution in Australia. It is particularly abundant in overstocked pastures in coastal districts, owing to the more palatable species having been eaten out. Stock will eat it, of course, when forced to do so in the absence of other fodders. Pitted blue grass is very abundant in New South Wales and parts of Victoria where, possibly owing to the colder climate, it assumes a reddish tint, and is in consequence known as red leg, or red grass. In Queensland it is frequently known as coastal blue grass.

The improvement of old pastures overrun with this grass is a difficult proposition In the Southern States, experience has shown that top-dressing with 1 cwt. of superphosphate per acre, preferably using a drill or spreader for the purpose, and the sowing of a small mixture of various clovers is the most satisfactory way of dealing with the pest. Under Queensland conditions, the most satisfactory clovers are white clover, cluster clover, and burr trefoil. About 1 lb. of each should be used per acre, and if desired, about 5 lb. of prairie grass can be added.

C. T. White.

CARE OF MILK UTENSILS ON THE FARM.

Milk as it comes from the average healthy cow contains comparatively few micro-organisms, and these are for the most part inactive in milk. There are many sources from which the bacteria responsible for souring, bad flavours, and other forms of deterioration may gain entrance to milk. Premature souring is very often caused by the use of milk vessels—pails, strainers, coolers, or cans—which, for some reason, are in a state of disrepair. A single utensil which has become worn or bent with continued use, and has developed cracks or crevices, may harbour undesirable bacteria capable of spoiling milk which has been otherwise very carefully produced.

With the cooler weather, summer troubles are apt to be forgotten: but if the cause is not removed, they will crop up again with the first hot spell. A thorough inspection of all milk vessels and equipment is, therefore, desirable, repairs or renewals being made where necessary. The seams of cans and pails should be resoldered if they have opened at all, and dents should be straightened out. Where the defect is more serious, there should be no hesitation in discarding the vessel, as it is only false economy to keep it in use.

No ordinary method of cleaning can dislodge bacteria established in very small crevices for they are well protected, and subsist on the small amount of milk solids left behind whenever the vessel is used. Even steam treatment will not destroy them completely.

Off-flavours, such as tallowy and cardboard taint in both milk and cream, are due to the presence of small amounts of copper and iron, which often come from coolers with defective tinning, or from rusty utensils. These flavours develop rapidly under favourable conditions, such as the exposure of the milk or cream to direct sunlight. They cannot be removed and it is, therefore, necessary to have any worn surfaces retinned as a preventative. Provided no abrasive is used in the preliminary cleaning—a stiff brush will usually remove milk solids—and no strong chemicals are applied, the tinning should have a reasonably long life.

Miss M. J. Griffiths,
Dairy Science Laboratory.

ANTISEPTICS.

Antiseptics are useful in the treatment of a wound and can be applied in two ways:—

1. As a weak solution to wash out the interior of the wound.
2. As dressings impregnated with the antiseptic to absorb any discharge, and prevent the further growth of germs. They also prevent contamination from outside sources.

Stockowners frequently use antiseptics at too great a strength, and do more harm than good. Some tissues are very susceptible to injury and solutions should not, therefore, be used at more than the recommended strength.

Antiseptics are particularly valuable for cleansing the hands before touching a wound, and in concentrated form some can be used to sterilise instruments when boiling water is not available.

After shaving off the hair surrounding a wound, the skin requires treatment with an antiseptic solution before any surgical operation is performed.

In emergencies, a wound should first be cleaned, then treated with an antiseptic, and protected from contamination.

Some common antiseptics are:—

Tincture of iodine—invaluable for immediate application to cuts and scratches.

Methylated spirits—used in undiluted form causes smarting, but has no ill effect on the tissues.

Permanganate of potash (commonly, though not correctly, known as Condy's fluid)—can be added to boiled rain water to make a deep pink antiseptic fluid which is mild in its action.

Boric acid—a saturated solution is made by adding two teaspoonsful to each pint of boiled rain water, and allowing the undissolved material to settle. A useful eye lotion can be prepared by mixing equal parts of the saturated solution and water.

Peroxide of hydrogen—an antiseptic and a deodorant. It is usually used at a 3 per cent. strength, and may be purchased as such. The stronger 30 per cent. solution must first be broken down to a milder form by adding nine parts of water to one of the solution.

—*W. Dixon.*

RATSTAIL OR PARRAMATTA GRASS.

The attention of coastal dairy farmers is drawn to the spread in paspalum and other useful pastures of the weedy ratstail or Parramatta grass. This is a tufted, perennial grass which reaches a height of up to 3 feet. The leaves are narrow, rolled, and wiry, and the seed-stalks are slender and carry a seed-head somewhat resembling a rat's tail.

Ratstail grass is commonly associated with inferior pasture types on second-class grazing country, and its spread into better class pastures is considered to be due to impoverishment of the originally fertile soil underlying those pastures. Since ratstail grass is useful for pasturage only in its very young stages of growth, its replacement of paspalum represents a serious decline in the carrying capacity of the invaded pasture.

Digging or pulling the grass out when it occurs as isolated plants is temporarily effective, but the most efficient means of controlling the spread of the weed is periodical renovation of the pasture with the object of building up the soil fertility and so enabling the paspalum to compete successfully with weed growths.

—*C. W. Winders.*

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Dudley Eglinton's Useful Life.

ASTRONOMY AND TECHNICAL EDUCATION.

TO the present generation of Queenslanders, it was by his fame as an astronomer that the late Dudley Eglinton, whose death at his home at Virginia, near Brisbane, took place on the 10th June, was best known. Even before he entered seriously on the study of the stars, however, Mr. Eglinton had laid the people of the State under a debt of gratitude to him by his achievements in the realm of technical education. He also had rendered valuable service to the community as secretary and librarian of the Brisbane School of Arts for 22 years, during which he had been largely responsible for placing the affairs of that institution on a sound foundation.

Plate 34.—The Late Dudley Eglinton.

Readers of the Queensland Agricultural Journal will remember him chiefly, with appreciation and gratitude, as the contributor of the monthly astronomical data for Queensland which have been such a valuable feature for a number of years past.

Born at Newcastle-on-Tyne, England, on 12 October, 1850, Dudley Eglinton was a son of Mr. William Eglinton, who had been on the staff of the South-Eastern Railway Company for several years before he decided to bring his family to Australia. After he had been in Queensland for a short period, he was ordained as a Minister of the Church of England. He was the first clergyman to take charge of the Cleveland parish, and subsequently was transferred to Goondiwindi.

After having gained his primary education in private schools, Dudley Eglinton (then aged 16) entered Durham University; but his studies there were terminated 12 months later on his father deciding to come to Australia.

Began as School Teacher.

His first occupation in Queensland was as assistant teacher in the National school at Warwick, under the late Mr. J. A. Canny, who afterwards gained a high reputation as an inspector of schools. Eighteen months later, young Eglinton became a member of the teaching staff at the Church of England School at Toowoomba. He subsequently was a teacher at the Valley primary school, but had only been there for a few months when he applied for, and secured, the secretaryship of the Brisbane School of Arts. That was in 1874. At that time the institution was at the corner of Queen and Creek Streets, where the Queensland National Bank now stands; but in 1878 possession was taken of the site in Ann Street, where the library has since been carried on.

How Technical Education Started.

It was through conversations he had with people who used the library and reading room that Mr. Eglinton realised the need for further educational facilities such as those which night classes and lectures might afford. It was from this germ of thought that the idea of an elaborate scheme of technical education sprang. It was almost entirely as the outcome of Mr. Eglinton's activities that art classes were started under the tuition of Mr. J. A. Clarke, an artist, and subsequently classes for instruction in book-keeping, shorthand, mathematics, French, German, carpentry, cookery and other subjects, under specially qualified teachers, were arranged for. The scheme was so successful and grew to such dimensions, that Mr. D. R. McConnell, M.A., was appointed director in 1889 and, later again, the Technical College was taken over by the Department of Public Instruction.

Interest in Astronomy.

When, at times, Mr. Eglinton was asked how he first came to be interested in astronomy, he would tell of his good fortune when, as a young teacher in Toowoomba, he had made the acquaintance of Dr. and Mrs. Carr-Boyd, and had been led by the latter to appreciate the beauties of the southern sky. In later years, he availed himself with enthusiasm of opportunities for stellar observations, and for an intensive study of the science of astronomy. Finding this subject increasingly fascinating, Mr. Eglinton devoted much of his spare time to the writing of articles on astronomy for the press, and in the preparation of lectures for delivery before various societies. One of his first articles, in which he discussed the discovery of a new planet, Ceres, and of a group of other minor planets, is dated February, 1897. Long and short articles were published in the press from time to time. Many special articles were written on his favourite subject "The Southern Cross," the first dating back to 1904, while the last was published in this journal, in December, 1936. A comprehensive paper on the Southern Cross and the early history of astronomical activity in Australia was read at the inauguration of the Queensland Astronomical Society, on 1st October, 1927.

In 1912, on the motion of Colonel E. F. Plant, of Brisbane, seconded by Sir Benjamin Stone, who acted on a letter of recommendation from Sir William MacGregor, the then Governor of Queensland, Mr. Eglinton was appointed a Fellow of the Royal Astronomical Society of England, an honour he always greatly prized. Sir Benjamin Stone was a specialist in astronomical photography.

The late Mr. Eglinton was twice married, his second wife being the widow of the late John H. Nicholson (author of "Halek" and other literary works). He leaves three sons one of whom is the Rev. Eric Eglinton (rector of Pialba) and two daughters, Mrs. Essex Evans is a sister of the deceased gentleman.

About 1924 the late Mr. Eglinton had the misfortune to lose his sight, as a result of his continuous use of a telescope in stellar observations. He, however, was enabled to continue his work with the devoted help of his wife; and he was so happy in himself, that those in his company, whilst engaged in animated conversation, were almost prone to forget that he was totally blind.

Law Relating to Bush Fires.

LIABILITY FOR DAMAGE DONE.

A CASE of considerable interest to the man on the land came before the Magistrate's Court in Maryborough on 7th June, when one farmer claimed £200 from another farmer, alleging that the defendant negligently made a fire on his land, and that owing to his negligence, the fire swept on to the plaintiff's property adjoining, doing material damage. The plaintiff claimed that 2 acres of plant cane valued at £92, 2 acres of ratoon cane, valued at £52, 1 acre of pineapples, valued at £60, and 309 standing pine trees, valued at £100, were destroyed—a total value of £304.

In the course of his judgment, Mr. J. A. Murray P.M., gave an interesting exposition of the law respecting the liability of an occupier of land for damage done by a fire which had spread from his property to an adjoining property or properties. Centuries ago, he said, an occupier of land was absolutely liable for damage caused by escape of fire from his land unless he could prove that the escape was due to the act of a stranger or act of God. Then in Queen Anne's reign, a statute was passed which operated to remove from the rule of absolute liability, cases where the origin of a fire could not be shown, that is to say, cases where a fire was accidental within the meaning of that statute. There still remained, however, the question of liability for damage done by fire lighted intentionally but without negligence.

The magistrate quoted an English case, Rylands v. Fletcher, heard in 1868, in which a rule had been laid down that if a person brings a dangerous thing on to his own land he is liable for damage caused if it escaped. Very soon after this decision, it was generally accepted that fire is a dangerous thing within the meaning of the rule, and that if an occupier of land allowed it to escape, he is, unless it were "accidental," liable for any damage it may cause. In recent times, the rule as to absolute liability has been whittled down. The rule that Ryland v. Fletcher does not apply to a "natural user of land" was gradually extended and held to cover "in certain cases" the use of fire.

Among other cases cited by the magistrate was a New South Wales case, Webber and Hazelwood (in 1934), in which the defendant had lit a fire on his land, and burnt off some 100 acres of stubble and during the process a stump was ignited and, a few days later, a high wind caused the fire from the stump to spread to, and do damage on, the plaintiff's land.

Evidence was given that the burning off was an ordinary farming operation conducted in a way in which the majority of farmers in the district burnt off their stubble. The jury gave a verdict that the defendant was not guilty of negligence. On appeal, the High Court held that the defendant was liable, independent of negligence, as it was not an ordinary or natural or reasonable use or employment of land, even if all the farmers in the district took the risk.

The facts found by the magistrate at Maryborough were as follows:—"That on the 28th October 1936, after sundown, defendant who is a farmer . . . , occupying over 100 acres of forest, scrub and cultivated land, lit a fire on his land for the purpose of burning off grass and rubbish. After a time, he left the fire untended and went home. At 9 p.m. he discovered that the fire had caught a dead mahogany tree which smoulders and burns slowly. Meantime, 20 to 30 acres of his grass had been burnt. He stood by the burning tree for some time, but finally went home again. About mid-day next day, while he was working nearby, a high wind arose causing sparks to fly from the branches and tree which was about 40 feet high. Despite his efforts to control them the sparks were blown across a dry creek nearby and set fire to dry grass on the opposite side. The grass fire got away from him and spread from his land into plaintiff's land causing damages to growing crops and standing timber. At the time the fire was lit the weather had been dry and the grass was in consequence, dry and inflammable.

Mr. Murray held that, in view of the decision of the High Court, in the case of Webber and Hazelwood, it was made clear that "in considering whether any particular user of land is or is not a natural user, the extent of the risk that such user may cause of damage to neighbouring occupiers must be taken into consideration. It remains a question of fact, in each particular case whether or not any particular user is to be regarded as a natural user."

"In this case," continued the magistrate, "the act of defendant in lighting dry grass in open country at a very dry time of the year and leaving it untended and uncontrolled led to the mahogany tree catching alight, and he had difficulty in controlling this tree fire, for, next day when a high wind arose sparks were blown therefrom on to dry grass about a chain or so away and the grass caught fire and got away from the defendant despite his and his wife's valiant efforts.

"I am therefore of the opinion that the defendant's act was not a natural use of the land and that consequently he is absolutely liable for the damage caused quite apart from negligence. Even assuming it was a natural use of land I find the defendant was negligent in allowing the grass fire to set the mahogany tree on fire during his absence. Further, on the following day when he discovered the sparks from the mahogany tree were becoming dangerous he should have obtained assistance to make effective firebreaks on the opposite side of the creek. I am satisfied though that to cut down the tree at that time would have been dangerous to the person and to the spread of the fire to the grass nearby."

Judgment was given for the plaintiff as follows: Plant cane £92; ratoon cane £48; pineapplies £60; standing pine £75; a total of £275 less the £104 abandoned by the plaintiff to bring the case within the jurisdiction of the magistrate's court. The judgment therefore amounted to £171.

LIMING RATOON CROPS.

Farmers frequently learn that their land is in need of liming, just after they have planted their cane, and they are desirous of making an application of this material after the plant cane has been harvested.

In these circumstances, the lime—either burnt or crushed—may be broadcast over the trash, after harvesting. When the trash is burned the ash and lime are cultivated into the surface soil, and given reasonably moist conditions the benefit will readily be apparent on the first ratoon crop.

If this procedure be followed, the application of a fertilizer mixture containing sulphate of ammonia, or of sulphate of ammonia itself, can be made within a month without danger of loss of ammonia from the fertilizer.

H.W.K. in *The Cane Grower's Quarterly Bulletin* (Bur. Sugar Expt. Stns.)

Sugar Levies.

(Abbreviated Notice.)

1937 SEASON.

Regulations under "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1935," have been approved, providing for levies on suppliers of cane to sugar-mills at the following rates for the season 1937 (the figures for 1935 and 1936 are given for comparison purposes:—

Name of Mill.	General Levy by Queensland Canegrowers' Council.	Administrative Levy by District Executive.	Administrative Levy by Mill Suppliers' Committee.	Special Levy by Mill Suppliers' Committee.	Total Levies for 1937.	Total Levies for 1936, given for comparison.	Total Levies for 1935, given for comparison.
	d.	d.	d.	d.	d.	d.	d.
Mossman Central	¾	1¼	..	..	2	2¾	2¾
Hambledon	¾	¼	¼	..	1¼	1⅝	1⅝
Babinda Central	¾	¼	3/16	..	1 3/16	1¼	1⅛
Mulgrave Central	¾	¼	..	..	1	1⅛	1⅛
South Johnstone Central	¾	1½	..	..	2¼	2⅜	2¼
Goondi	¾	1½	¼	..	2½	2⅜	2¼
Mourilyan	¾	1½	..	..	2¼	2¼	2¼
Tully River Central	¾	1¾	..	..	2½	2½	2½
Macknade	¾	½	½	..	1¾	1¾	1⅝
Victoria	¾	½	½	..	1¾	1¾	1⅝
Kalamia	¾	..	¾	¾	2¼	2¼	1¼
Pioneer	¾	..	1	⅝	2⅜	1¾	1¾
Inkerman	¾	..	⅜	..	1⅛	1	1
Invicta	¾	..	1½	..	2¼	1¾	1¾
Proserpine Central	¾	1	..	..	1¾	1¾	1¾
Cattle Creek Central	¾	½	¼	..	1½	1½	1½
Plane Creek Central	¾	½	½	..	1¾	1¾	1¾
Marian Central	¾	½	½	½	2¼	2	2¼
North Eton Central	¾	½	..	..	1¼	1¾	1¾
Pleystowe	¾	½	½	½	2¼	2¼	2
Racecourse Central	¾	½	½	..	1¾	1¾	2¼
Farleigh	¾	½	½	..	1¾	1¾	1¾
Qunaba	¾	¾	¼	..	1¾	1⅛	1¼
Bingera	¾	¾	¼	..	1¾	1½	1¼
Fairymead	¾	¾	½	..	2	1¾	1½
Gin Gin Central	¾	¾	¾	..	2¼	1½	1¾
Millaquin	¾	¾	..	..	1½	1¼	1¼
Isis Central	¾	½	..	..	1¼	1	1¼
Maryborough	¾	¾	..	..	1½	1¼	1½
Mount Bauple Central	¾	¾	..	..	1½	1¼	1½
Moreton Central	¾	..	1	½	2¼	2¼	2½
Rocky Point	¾	..	¾	..	1½	1½	1¾
Eagleby	¾	..	..	..	¾	¾	1

No poll will be taken in respect of the General Levy of ¾d. per ton (first column) for the Queensland Cane Growers' Council, or for the administrative levies by District Executives or Mill Suppliers' Committees (second and third columns).

In the fourth column, the levies on cane supplied to the Kalamia, Pioneer, Marian Central, Pleystowe, and Moreton Central Mills will be used in defraying the costs of employing farmers' representatives at those mills for the current season. In the case of these levies, growers may petition for a poll, and the petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the cane suppliers to the five mills concerned.

In addition to the foregoing levies, the undermentioned Mill Suppliers' Committees are empowered to make particular levies on growers within each of the following districts, at the following rates :—

Name of Mill Suppliers' Committee and Mill to which Cane is Supplied.	Description of District upon the Growers wherein Levies will be made and desciption of Cane upon the Growers whereof Levies will be made.	Amount of Levy per ton of Cane Supplied.	Purposes of Levy.
		d	
Isis Central	Pialba district within the boundaries of the parishes of Urangan, Vernon, and Bingham, county March	1¼	To be used for administrative purposes by Pialba Branch of Isis Central Mill Suppliers' Committee.
Isis Central ..	All cane consigned on the railway by Government trucks from Booyal, Junien, and Marule Sidings on the Dallarnil Railway	½	To be used for administrative purposes by Booyal Branch of Isis Central Mill Suppliers' Committee
Mount Bauple Central	Mount Bauple district within the boundaries of the parishes of Gundiah, Liaro, Gootchie, Curra and St Mary	¼	To be used for administrative purposes by Mount Bauple Branch of Mount Bauple Mill Suppliers' Committee.
Mount Bauple Central	Yerra district within the boundaries of the parishes of Gungaloon Denison Doongul Woocoo, and Young	¼	To be used for administrative purposes by Yerra-Mungar district Branch of Mount Bauple Mill Suppliers' Committee
Maryborough ..	Pialba district within the boundaries of the parishes of Vernon Urangan, and Bingham, county March	¾	To be used for administrative purposes by Pialba District Branch of Maryborough Mill Suppliers Committee
Maryborough	Maryborough district within the boundaries of the parishes of Tinana, Maryborough Bidwell, Elliott Young, and Walliebum, county March	¼	To be used for administrative purposes by Maryborough District Branch of Maryborough Mill Suppliers' Committee.
Millaquin ..	All cane delivered at Yandaran Siding	¼	To be used for administrative purposes by Yandaran Branch of Millaquin Mill Suppliers' Committee
Racecourse Central	All cane hauled over Silent Grove tramline	2	To defray the costs of employing a farmers representative of the section of growers concerned at the Racecourse Mill for the current season
Marian Central .	All cane loaded at Dow's Creek and Langdon Siding	⅜	To be used for insurance and weighbridge maintenance by the Dow's Creek and Langdon Branch of the Marian Central Mill Suppliers Committee

Growers are given the opportunity of petitioning for a poll to decide whether or not the above levies shall be made. The petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the cane suppliers within any of the areas concerned.

All petitions must reach the Secretary for Agriculture and Stock, Department of Agriculture and Stock, Brisbane, on or before the 10th July, 1937.

Full particulars of these Regulations appear in the *Government Gazette* of the 20th May, 1937, or may be obtained on application to the managers of the various sugar-mills in Queensland or to the undersigned—

E. GRAHAM, Under Secretary,
Department of Agriculture and Stock,
Brisbane.

CARE OF STORED HONEY.

If honey is stored in a damp place and not thoroughly sealed up, it will absorb moisture, and if excessive moisture is so taken up the honey is liable to ferment and deteriorate in value. Do not leave the lid off the containers, or leave honey exposed for any length of time during the late autumn and winter months. If kept in a dry place in a sound container honey will keep good for years. It may granulate, but that is not a sign of deterioration, and in such cases it may easily be liquefied by immersion of the container in hot water.

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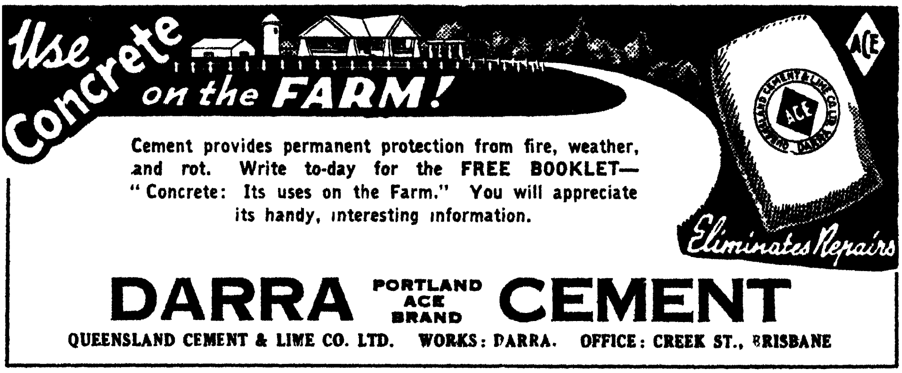
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PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Ayrshire Cattle Society, production charts for which were compiled during the month of May, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Wanulla Bantam III.	E. O. Jeynes, Raceview	12,065·5	509·37	Gay Prince of Bri Bri
SENIOR 3 (OVER 3½ YEARS), STANDARD 290 LB.				
Sunnyview Gentle 4th	A. E. Vohland, Aubigny	7,898·2	374·675	Jellicoe of Headlands
SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.				
College Wendie	Q.A.H.S. and College, Lawes	7,636·6	332·959	College Robin
JUNIOR 2 (UNDER 2½ YEARS), STANDARD 230 LB.				
Trevor Hill Polly	Geo. Gwynne, Umbiram	7,955·23	312·138	North Glen, Emblem
Trevor Hill Dove	Geo. Gwynne, Umbiram	6,953·19	282·152	North Glen Emblem
Trevor Hill Mermaid	Geo. Gwynne, Umbiram	6,834·66	277·224	Viscount of Corunna
JERSEY.				
JUNIOR 4 (UNDER 4½ YEARS), STANDARD 310 LB.				
Maurfield Golden Lily	F. Maurer, Darra	7,374·7	360·011	Prospect Monty
SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.				
Glenview Hopeful	F. P. Fowler and Sons, Coalstoun Lakes	6,505·1	337·078	Trinity Governor's Hope
JUNIOR 2 (UNDER 2½ YEARS), STANDARD 230 LB.				
Glenview Tinkelbell	F. P. Fowler and Sons, Coalstoun Lakes	5,806·7	284·167	Trinity Governor's Hope
Oxford Remus Dainty (272 days)	Oxenford Bros., Oxenford	4,444·87	260·608	Overlook Nancy's Remus
AYRSHIRE.				
SENIOR 3 (OVER 3½ YEARS), STANDARD 290 LB.				
Myola Jollity	R. M. Anderson, Southbrook	10,994·84	477·464	Longland's Bonny Willie 2nd

The Tropics and Man

Electrical and Other Effects

No. 6.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

IN this initial series of articles I have deliberately dealt with the somewhat technical subjects of temperature, humidity, air-movement, and radiation because these are the important causes of the effects of hot climates upon man. There remain certain minor climatic factors which must be looked at briefly, if we are to leave this branch of tropical study with a properly balanced picture of these causes. With them I shall deal to-day, so that in a future series we can confine our attention more to the man and the results in him of climatic stress and talk less about these technical though important causes.

Electrical Conditions.

We all know the feeling of tension which is experienced before a thunderstorm and the marked relief which is felt afterwards. Those who have experienced the violent dust-storms of the inland plains have noticed the same feelings there. It is quite a popular, and in the absence of any special evidence, a logical belief that it is the accumulation of electrical tension before and its discharge during a thunderstorm which is responsible for the sequence of general feelings. This belief is lent colour by certain individuals who seem to be peculiarly susceptible to these experiences and often predict a storm an appreciable time before the usual weather signs begin to accumulate. Further strength is given to the belief by the demonstration of similar or even greater electrical disturbances in the course of a dust-storm. A party of physicists, investigating the occurrence of thunderstorms in a part of South Africa, where they were very frequent, were very much troubled to find that their recording instrument showed on one occasion a much greater electrical discharge than usually accompanied thunderstorms, in spite of the fact that no storm had been over. Very careful testing showed no fault in the apparatus, and they were left with the conclusion that a dust-storm which had passed over was responsible for the discharge. Unfortunately, Nature did not repeat the experiment for them, and I do not know that anyone else has taken it up. Personally, I find it difficult to believe that such dense dust-clouds travel such distances as they do unless the dust particles are electrically charged.

Doubtful Effect of Ionization.

As I say, there is a popular belief that the electrical state of the atmosphere has a definite effect upon one's feelings of comfort, and certain evidence would fit in satisfactorily with this view. We must remember, however, that electrical disturbances are not the only things going on at the times of these storms. Before a thunderstorm, the air is often still, the temperature is high, and more importantly still the humidity is high. These are all conditions which interfere with loss of heat from the body and produce discomfort. The accumulation of angry clouds and the hushed voice of nature which precede the storm both have a profound psychological effect, particularly in those people who dislike violent thunderstorms. Such considerations would do no more than sound a warning against pinning one's faith absolutely to the belief in electrical effects, were it not for certain experiments which have been conducted. A number of subjects were allowed to breath air which, without their knowing, was charged with electrical particles of one or other kind. In the majority of normal people the breathing of such air had no definite effect upon sensation or upon a number of other bodily functions. I myself sat as a subject upon one occasion, and the only time I experienced any change in sensation was when the plant, unknown to me, was not working and I was breathing ordinary every-day air.

While normal people were not affected in these experiments, people of the "rheumatic" type and people with disturbance of blood pressure often did experience some alteration of sensation and showed other evidence of being affected by the electrical charges. This matter is still being investigated, and the results should be of interest. As the matter stands at present, the importance of electrical changes to perfectly normal people appears to be small, but to certain susceptible people they may be of some importance.

Barometric Pressure.

It is quite definite, of course, that when the barometric pressure is markedly lowered, as in climbing high mountains, people suffer from lack of oxygen. It is equally true that a marked increase in pressure (over two atmospheres) also affects the body, not while it is on, but if it is suddenly released. These effects are seen in divers and in compressed air workers. It is highly doubtful, however, whether the normal fluctuations which occur at moderate heights in different parts of the world and at different times have any effect upon human welfare. An authority in tropical medicine once solemnly stated that the lowered barometric pressure in the tropics (itself a doubtful statement) meant that tropical dwellers must suffer from lack of oxygen. This statement was repeated by an even greater authority in tropical medicine. Any second-year medical student could tell you why this statement cannot possibly be true—which only shows how authorities can make bad slips when off their beaten track.

Chemical Effects.

In the days before more exact knowledge was possible, it was the fashion to ascribe puzzling medical conditions to vague atmospheric influences and "miasmata." There was a feeling that in certain areas there were chemical or even more mysterious vapours abroad in the air which left death and ill-health in their wake. These conditions have largely been tracked down to much more prosaic causes such as mosquitoes, germs, and the like, but from time to time the chemical theory is resurrected to explain, or rather dispose of some difficulty in understanding the occurrences of disease. As a matter of fact, the chemical composition of the air all over the world is remarkably constant, apart from certain very localised and well-known instances, such as the accumulation of carbon-dioxide gas in lime-stone caves. There is certainly no evidence to associate chemical changes in the air with tropical conditions.

Mechanical Effects.

The purely mechanical effects of wind and rain are well seen in the rugged countenance of the all-weathers man. These are more beneficial than otherwise, although sometimes in blondes they may assist radiation in producing skin cancers. Of more importance is the abrasive effect of sand and dust. This probably accounts for the frequent occurrence of small fibrous growths on the eye-ball in dusty climates. These "pterygia" or "pingueculae" start from the corner of the eye and grow very slowly across. Occasionally they grow large enough to require removal—a fairly simple procedure. They are frequently confused by well-meaning advisers with cataract, but this is an unnecessary and lamentable blunder which has caused considerable distress to many people. Another effect of dust is to irritate the lining of the nose, and, with the swelling produced by heat radiations, to produce blockage of the nasal passages. This seems to be more noticeable in newcomers than in residents.

WORMS IN POULTRY.

During the rearing of birds about to commence their first season of production, diseases such as coccidiosis, bacillary, white diarrhœa and roup will have taken their toll. These diseases are spectacular in their onset and the symptoms manifested and the mortalities experienced have compelled the poultry farmer to undertake control measures in order to mimimise his losses as much as possible.

In many instances, however, worm infestation has been overlooked. The effects of worm infestation are usually insidious in nature, and being accumulative do not attract attention until the birds are seriously affected. Such effects include failure to make normal growth and even loss of weight, loss of appetite and activity, dull, ruffled plumage, and a paleness of the comb and shanks. The mortality, especially among young birds, may be serious. More important still young pullets, while maintaining a ravenous appetite and being apparently in fair health, are not producing their normal quota of eggs.

Of the various worms which infest poultry one of the most important is the large roundworm, which grows up to 4 or 5 inches in length, and is found in the intestine. Where the farmer pays careful attention to sanitation and cleanliness this and other worms rarely become dangerous for, by the regular removal of droppings and the adoption of other measures which promote cleanliness, the source of infestation is removed. Prevention of infestation is most important in the control of parasitic worms. There are, however, certain drugs which may be employed to remove the worms from the birds, and if treatment is employed regularly the infestation should be of no great importance. Treatment of poultry for worms may be undertaken either by mixing certain drugs with the mash (flock treatment), or else by giving the drug to each individual bird (individual treatment).

Flock Treatment.—Flock treatment can be applied with success only when the birds are kept under intensive or semi-intensive conditions. The procedure is to mix nicotine sulphate with the mash at the rate of .5 cubic centimetre of nicotine sulphate for every 1 lb. of dry mash. The amount of nicotine sulphate required is incorporated with just sufficient water so that when mixed the mash is flakey. About 1 part of nicotine sulphate to 400 parts of water is usually adequate. The mixing should be thorough so that no lumps remain. This treated mash is mixed fresh daily and fed continuously for four days.

Individual Treatment.—The best drug to use for individual treatment is carbon tetrachloride. This may be given in capsules or by means of a syringe and rubber tubing. The birds are starved overnight and treated next morning. They may be fed immediately after treatment. The doses range from .5 cubic centimetre to 2 cubic centimetres, depending on the size of the bird. If the syringe is used great care must be taken to avoid delivering the drug into the windpipe, which would cause instant death. Before undertaking this treatment farmers should apply to the Animal Health Station, Yeerongpilly, for further details.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Madagascar Plum. Worm Seed.

K.R.E.B. (Marian)—

Your specimen is the Governor plum or Madagascar plum, *Flacourtia Ramontchi*, a native of Madagascar, but cultivated widely in tropical and sub-tropical countries. It is an excellent, edible plum; the male and female trees are distinct, the females, of course, only bearing fruit. The Burdekin plum is a totally different plant, a native tree, common in the scrubs from the Burnett District northwards.

The weed is *Chenopodium ambrosioides*, the worm seed. The seed of this plant and an allied species is the source of oil of chenopodium, largely used as a worm expellent. It is not known to be poisonous or harmful in any way, but we do not remember ever having seen stock eat it. Its extraordinarily strong odour would probably prevent them from touching it.

Bull-head Burr. Khaki Weed. "Fat Hen."

R.A. (Nanango)—

(1) *Tribulus terrestris*, bull-head burr. This plant is very widely spread over the warmer temperate regions of the world, and is a moderately common weed in Queensland. It is particularly abundant on some of the Downs country of the Central West. It occurs in South Africa where it is accused of causing a disease in sheep, known as big-head, or yellow-head. No trouble, so far as we can ascertain, has been caused by the plant in Australia.

(2) *Alternanthera repens*, khaki weed, a native of tropical America, and now widely spread as a weed in most warm temperate countries. It is supposed to have been introduced into Australia from South Africa about the time of the Boer War.

(3) *Chenopodium album*, fat hen or goose foot, a very common farm weed in Queensland, and not known to possess any poisonous or harmful properties.

One of the Sorghums.

T.P. (Maleny)—

Your specimen is not Johnson grass, but a very closely allied sorghum, *Sorghum verticilliflorum*, a native of Africa, now very common in Queensland, and we think as common, if not commoner, than the true Johnson grass. It is frequently seen in cultivation lands and similar places where the ground has been disturbed. It grows very vigorous, and is easier to eradicate than Johnson grass, as it does not form the white, underground stems that Johnson grass does. Ordinary digging out will soon get rid of it. Like other sorghums, it contains a prussic-acid-yielding glucoside, in fact, it is one of the worst offenders in this respect, and caution must, therefore, be exercised in feeding stock with it.

"Scrub Panicum."

"Inquirer" (Ridgelands)—

The specimen represents *Setaria australiensis*, commonly called in Queensland, the scrub panicum, a native grass, frequently seen around scrub clearings, and along scrub tracks. It is generally regarded for such places as quite good fodder, but we think it is hardly worth cultivating, for where it should grow, better fodders, such as giant setaria or Manchurian millet, which are very closely allied to it, would grow equally as well. Seed of the scrub panicum is not stocked by nurserymen, but the giant setaria is obtainable through commercial channels at a fairly cheap rate.

Plants from the Murgon District Identified.

C.G. (Moffatdale Project Club, Murgon)—

1. *Arundinella nepalensis*—a common grass on forested hillsides in many parts of coastal Queensland. It is also very common in the Burnett district. We have not heard a local name given to it. It is not usually regarded as of much value as a fodder.
2. *Cyperus fulvus*, a sedge, not a true grass. The sedges, on the whole, are not regarded as having the same value as true grasses.
3. *Setaria glauca*, pigeon grass—a useful grass, particularly for wet, low-lying paddocks. It is also commonly seen as a weed of cultivation.
4. *Bothriochloa intermedia*, forest blue grass—the commonest native grass in many parts of the Burnett district and Callide Valley.
5. *Sporobolus elongatus*, rat's tail grass—not generally regarded as of much value as a fodder.
6. *Bothriochloa decipiens*—bitter blue grass, or pitted blue grass. The latter name comes from a small pit that can be seen in the spikelet. This grass has over-run many paddocks to the exclusion of other species, owing to better sorts having been eaten out. Stock will eat it, but do not care for it when other feed is available.
7. *Chloris ventricosa*—a native chloris or windmill grass, generally regarded as a good fodder. It sometimes comes up very thickly in cleared brigalow country, or cleared vinescrub country.
8. *Paspalum dilatatum*, common paspalum.
9. *Eleusine indica*, crowfoot grass—a very common grass, widely spread over the warmer regions of the world. In Queensland, it occurs mostly either as a weed of cultivation or where the ground has been disturbed. It is moderately palatable to stock, but, like sorghum and some other grasses, contains a prussic-acid-yielding glucocide; very little trouble has been experienced with it in Queensland.
10. *Eragrostis leptostachya*—paddock love grass. The love grasses are of only secondary value as fodders, but are rather useful grasses in mixed native pasture.
11. *Digitaria marginata*, summer grass—occurs mostly as a weed of cultivation or where the ground has been disturbed. It is quite palatable to stock.
12. *Digitaria divaricatissima*—a roly-poly grass.
13. *Pennisetum alopecuroides*—swamp foxtail.
14. *Eriochloa* sp.—early spring grass. We have several species of Eriochloa in Queensland, and they all go under the name of early spring grass. They are very palatable. The vernacular name is not particularly appropriate, as they are no earlier than many other grasses that come up after early spring rains.
15. Specimen damaged, but looks like *Cynodon dactylon*, the common couch grass.
16. *Eragrostis cilianensis*—stink grass. This grass is a native of Southern Europe, and in Queensland occurs mostly as a weed of cultivation. It is not particuarly palatable to stock. The name stink grass arises from the number of glands along the leaf edge which give off a peculiar, and not altogether unpleasant, odour.
17. *Aristida glumaris*—a species of wire grass or three-pronged spear grass. The wire grasses or spear grasses, on the whole, are of very poor quality as fodder.
18. *Chloris virgata*, feather top or woolly top Rhodes grass—a very luscious-looking grass, very common as a weed of cultivation and in places where the ground has been disturbed. In spite of its appearance, stock do not seem to take readily to it, although they will eat it, we have been told, in the form of hay.

Purple Datura.

Q.S.Q. (Mitchell)—

The specimen represents *Datura cornucopia*, the "horn of plenty," or purple datura, a plant, we believe, of garden origin. It is very closely allied to the common stramonium or thorn apple, naturalised along watercourses on the Darling Downs and in the Maranoa district. This common species is frequently known as castor oil, although the true castor oil, naturalised in coastal Queensland, is a different plant.

Practically all species of *datura* are poisonous in all parts, the seeds being the most virosent. The one you sent is frequently cultivated as a garden subject, and we have never known it to escape, and become a bad weed-pest. It contains, however, possibilities in that respect.

Elephant Grass.

A.W.T. (Chermside)—

Elephant grass is still cultivated to some extent in coastal Queensland, but has gone out of favour somewhat, as it is not so palatable as other fodders. It also is inclined, if left standing, to grow to rather a hard cane. On this account, the grass should be kept cut back, to not more than six feet high. If preferred, it can be grazed, and stock under these conditions, usually eat it well down. It is very easily propagated, either by division, or cuttings, If propagated by cuttings, two or three nodes of the hard cane part should be used, and two nodes or joints placed in the ground. If preferred, they can be planted horizontally, like sugar-cane. Grown from division, the plants should be cut well back, almost to the ground, and the stool divided into individual cuttings.

The grass is fairly nutritious, and we think worth growing, if kept treated in the way recommended. If the stock are turned on to it, when it is very high, they will eat it back to the cane portion, and this will then send out tufts along the edge, which are quite palatable.

Common Weeds in North Queensland.

Inquirer (Townsville)—

The specimens collected at the railway trucking yard at Bambaroo have been determined as follows:—

1. *Flemingia parviflora*—a native legume, very common in the pastures of North Queensland.
2. *Urena lobata*—one of several weeds known in the North as Chinese burr.
3. *Sida acuta*—popularly called *Sida retusa* in the North.
4. *Capsicum fastigiatum* Chili. This species is the main source of cayenne pepper.
5. *Sida cordifolia*—flannel weed.
6. *Gomphrena decumbens*—a plant of the Amaranth family, a very common weed in North Queensland, but for which we have not heard a local name.
7. *Hyptis suaveolens*—one of the several plants of the family *Labiateae*, known in North Queensland as "mint."
8. *Erechthites quadridentata*—a common weed of the family *Compositeae*, for which we have not heard a common name.
9. Grass—seed-heads would be required to identify.
10. *Xanthium pungens*—noogoora burr. The noogoora burr is poisonous only in the cotyledon stage. In the stage of the present specimen, as far as we know, it is quite harmless.
11. *Stylosanthes sundaica*—Townsville lucerne.
12. *Bothryochloa intermedia*—a species of blue grass.
13. *Acanthospermum hispidum*—star burr.
14. *Physalis minima*—wild Cape gooseberry.

All are very common weeds throughout the whole of North Queensland, particularly in the coastal country. None of them is known to cause any trouble to stock, as far as we know.

Specimens from Tamborine Mountain Identified.

G.A. (Tamborine)—

(1) *Marsdenia rostrata.* Milk vine: this plant is poisonous to stock.

(2) *Solanum campanulatum.* A prickly species of Solanum very common as a secondary growth on Tamborine Mountain and other places in South-eastern Queensland. We have never heard of stock eating it to any extent, although parts of most solanums are harmful.

(3) *Stephania hernandiaefolia.* Tape vine, a plant poisonous to stock.

(4) *Solanum stelligerum.* A species of Solanum or Potato Bush very common as a secondary growth on Tamborine Mountain and coastal Queensland.

(5) *Vitis clematidea,* a wild grape vine not known to to be poisonous or harmful in any way to stock.

If you are losing stock from poisonous plants we are inclined to regard number (1) as the most likely cause of the trouble.

Rice Grass.

C.F.R. (Caloundra)—

It is rather difficult to determine grasses correctly in the absence of seed-heads, but we think the one you sent is *Leersia hexandra,* a rice grass, generally regarded as an excellent fodder for wet, swampy situations.

Some Bush Flowers.

E.J.S. (Kalbar)—

(1) *Cynoglossum suaveolens.*

(2) This looks like the same as No. 1, but in very young flower. This plant is frequently known as Native Forget-me-not.

(3) *Pimelea pauciflora,* sometimes called scrub kurrajong, probably on account of the fibrous nature of the bark. It has been proved by feeding tests to be poisonous to stock, but stock rarely eat it in sufficient quantities to cause trouble.

(4) *Cynoglossum latifolium.*

(5A) and (5B) *Pimelea pauciflora.*

(6) *Synoum glandulosum,* a tree of rather irregular growth, commonly called scentless rose bush.

(7) *Drimys dipetala,* sometimes called pepper bush.

(8) *Bothrychium ternatum,* parsley fern.

(9) *Helipterum anthemoides.*

(10) *Peperomia reflexa.*

(11) *Cadellia monostylis.* This plant was called *Guilfoylia monostylis* by Mueller, and now most botanists keep his genus distinct from Cadellia. In this, we think they are right.

(12) *Liparis reflexa.*

(13) *Psychotria loniceroides.*

(14) Are you sure the leaves are correctly matched with your description of the flower? Your description of the flower fits almost exactly *Tarretia,* either *argyrodendron* or *T. actinophylla.* The former is commonly known as hickory, crow's foot elm, or booyong, the latter sometimes by similar names, or as black jack. Both occur in the Cunningham's Gap scrub. The leaves, however, do not seem to belong here, and we cannot place them satisfactorily. It is often very hard to match leaves on the ground with those on the tops of the trees.

Plants from the Mid-West Identified.

C.H.D. (Roma)—

(1) *Glycine tabacina.* Glycine peas are very common legumes in the average native mixed pasture, both in coastal Queensland and further inland. The actual species are not very well defined, but we should say they should have much the same food value, and are quite useful herbs.

(2) *Desmodium campylocaulon* or tick trefoil, peculiar to the inland parts of Queensland.

(3) *Crotalaria dissitiflora,* a species of rattle pod.

(4) *Glycine tomentosa.*

(5) *Dichanthium sericeum,* blue grass.

(6) *Dichanthium sp.* This may be a form of No. 5, but the genus is at present under review, and in many cases, we cannot give specific names until our material has been revised by Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, England, who is monographing the group.

(7) A form of *Bothriochloa intermedia.* This differs from the ordinary intermedia in having a very much more branched inflorescence, but otherwise seems the same. It is quite common in Queensland, but as yet, has not received a distinctive varietal or specific name.

Button Grass.

F.McC. (Mundubbera)—

Your specimen represents the button grass, *Dactyloctenium radulans,* a very common grass in Western Queensland, but not so often seen nearer the coast. It is a grass that comes up very rapidly with summer rains and soon dries off. Like Flinders grass, however, when it dries off, it is generally regarded as a valuable fodder, and a good standing hay. It is one of the recognised important sheep grasses of the Western Downs.

Grasses, Millets and Sedges.

A.MacK. (Brookfield)—

(1) *Setaria geniculata* var. breviseta.

(2) *Setaria glauca.* Both 1 and 2 are sometimes called pigeon grass, also native setaria or wild millet, though this last name is applied to a number of grasses in Queensland. They are quite good grasses, though, usually speaking, they prefer old cultivation lands or rather damp situations. They are not so frequently seen in the ordinary pasture.

(3) A form of *Bothriochloa intermedia,* forest blue grass.

(4) *Kyllinga cylindrica,* Mullumbimby couch, a sedge, not a true grass. The sedges are separated from the true grasses on several botanical characters. They are not generally regarded as having the same fodder value as grasses.

(5) *Bothriochloa intermedia.*

(6) *Sporobolus Berteroanus,* Parramatta grass.

(7) *Cyperus gracilis,* a sedge. (See remarks on No. 4.)

(8) *Eleusine indica,* crow's foot grass. This grass is very widely spread over the warm temperate regions of the world. In Queensland, it mostly occurs as a weed of cultivation. Like young sorghum and some other plants, it contains a prussic-acid-yielding glucoside but fatalities from it in Queensland are exceedingly rare.

(9) *Brachiaria foliosa,* leafy panic grass, generally regarded as an excellent fodder.

(10) *Sida rhombifolia,* most commonly known as sida retusa, one of the commonest farm weeds in Queensland.

(11) *Alstonia constricta,* native cinchona, native quinine, or bitter bark. The bark of this tree is official in the British pharmacopœia, but the demand for it is very small, and the price low. It is used as a tonic.

(12) *Wickstroemia indica,* tie bush. The local name comes from the fact that the bark is very flexible, and was used as a source of fibre by the aborigines. On many occasions, this plant has been reported to us as poisonous to stock. Feeding experiments carried out on the leaves at Yeerongpilly some years ago gave negative results. The animals fed on the plant were very emaciated at the end of a fortnight's feeding, with the faeces stained with blood, but recovered when put on to ordinary food. A couple of years ago, some berries of this were received which, it was said, had caused the death of a child at Nambour. Fed to guinea-pigs at Yeerongpilly, they produced death in a very short time. It was seen, therefore, that the plant is most dangerous when in berry.

(13) *Mallotus claoxyloides,* a small tree, very common as a scrub regrowth in South-eastern Queensland. We have not heard a local name given to it.

(14) *Elaeocarpus obovatus,* pigeon berry, or blue berry ash, a very common tree along creek-sides in Southern Queensland. It bears white flowers in very great abundance during the late spring months, and these are assiduously worked by bees.

Stramonium or Thorn Apple.

The Shire Clerk (Rosewood)—

The specimen forwarded is the Stramonium or thorn apple, *Datura stramonium,* a very common weed in cultivation and along creek banks in Queensland. It is a very poisonous plant, but stock usually avoid it in the growing state. The only trouble that we have experienced with it has been when it has been cut with a crop, chaffed, and the subsequent chaff fed to working horses or chaff-fed cows. The leaves are used for making cigarettes for smoking to give relief in asthma.

White Cedar Berries.

A.H. (Laidley)—

The specimens forwarded represent *Melia dubia* (white cedar). The fleshy part of the berries of white cedar is undoubtedly poisonous to all classes of stock, pigs being particularly susceptible. Experimental work has proved that the bark and flowers are also poisonous. So far as we know, however, the leaves have not been found to produce death in animals that feed on them. Your enquiry has been passed on to Dr. W. R. Seddon, Veterinary Adviser, who has carried out some investigations on this tree.

Grasses Identified.

N.R.A. (Kabra, via Rockhampton)—

(1) *Bothriochloa decipiens,* sometimes called bitter blue grass, or coastal blue grass. It is very widely spread in Queensland, and on the whole, is of only secondary value as a fodder. It is exceedingly common now in some places, the more palatable native grasses having been eaten out.

(2) *Heteropogon contortus,* bunched spear grass.

(3) *Eragrostis leptostachya,* paddock love grass.

(4) *Enneapogon avenaceus,* white heads.

(5) *Eleusine indica,* crowfoot grass. This grass is very widely spread over the warmer regions of the world. In Queensland, it mostly occurs as a weed of cultivation, or in places where the ground has been disturbed. It has a very firm hold of the soil, and is, on this account, sometimes called "Holdfast." It is moderately palatable, but contains a prussic-acid-yielding glucoside. Nevertheless, there are very few records of its having been harmful to stock in Queensland.

(6) *Bothriochloa decipiens.*

(7) *Cyperus bifax,* a sedge. The sedges are very closely allied to the true grasses, but on the whole, have not the same fodder value. "The Principles of Botany for Queensland Farmers" which has been running as a series of articles in the Queensland Agricultural Journal, will soon be published in book form.

(8) *Eragrostis cilianensis,* stink grass. This is very widely distributed over the warmer regions of the world. In Queensland, it mostly occurs as a weed of cultivation. The name "stink grass" arises from the peculiar, but not altogether unpleasant odour, given off by the leaves when crushed. So far as our experience goes, stock do not take very readily to the grass, though we have been told that horses, when being worked in cultivation, will eat it at every opportunity. This, however, is hardly a normal test. They may eat it perhaps, in the form of hay, as it often occurs with grasses of this type.

(9) *Sida cordifolia,* flannel weed.

(10) *Dactyloctenium aegyptium,* button grass.

(11) *Chloris barbata,* purple top Rhodes grass.

(12) *Indigofera hirsuta,* hairy indigo.

(13) *Acanthospermum hispidum,* star burr.

Aggressive Weed Pests.

P.McM. (Ballandean)—

(1) *Ajuga australis,* Australian bugle, a native plant, fairly common in some parts in the forest pasture, and occasionally seen as a weed of cultivation. So far as we know, it has not established itself anywhere as a very aggressive weed-pest in cultivated land.

(2) *Verbena bonariensis,* purple top, a native of South America, now naturalized as a weed in many warm countries. It is a very objectionable weed in Queensland and New South Wales, aggressive, though on the whole, not particularly difficult to eradicate in small areas.

These are the names corresponding to the numbers on your specimens, though from your description, No. 1 is a vigorous upright grower, and No. 2, a low stunted plant. This seems to indicate that your specimen numbers and notes do not correspond.

Oat and Barley Grass.

J.T. (Charleville)—

(1) *Panicum decompositum,* barley grass, also commonly called native millet, though this latter local name is given to a number of grasses in Queensland. This grass is very common in many parts of Western Queensland, and provides a fair bulk of forage. Seeds were used by the aborigines in the early days as a source of grain.

(2) *Astrebla lappacea,* curly Mitchell grass, probably the best of the Mitchells.

(3) *Astrebla elymoides,* hoop Mitchell.

(4) *Themeda avenaceus,* tall oat grass; makes a good bulk of leafy bottom.

(5) *Themeda australis,* kangaroo grass.

Identification of Grasses.

J.S. (Eidsvold)—

(1) *Dichanthium sp.* one of the blue grasses. Most of the blue grasses are quite good fodders and play an important part in the mixed native pasture. They are not particularly drought-resistant, and do not stand up to heavy stocking.

(2) *Chloris divaricata*, one of the native chloris, or windmill grasses, but makes a fair bottom for sheep.

(3) *Bothriochloa intermedia*, forest blue grass.

(4) *Aristida sp.*, a wire grass or 3-pronged spear grass. We do not know of any way of getting rid of this plant. Species of wire grass or 3-pronged spear grass are very much inclined to over-run much of the sandy land in many parts of Queensland. In other places, they are very common on hillsides, and spread rapidly down, eating out all the better class of fodders. They are drought-resistant, and unpalatable.

(5) *Chloris gayana*, Rhodes grass.

(6) *Digitaria Brownei*, a fairly common grass in much of the sandy lands of Queensland. It is not known to have any particular virtues, but is probably quite useful in the mixed native pasture on such country.

(7) *Themeda avenaceus*, tall oat grass.

(8) *Tragus racemosus*, small burr grass.

(9) *Heteropogon contortus*, Bunch-spear grass, very palatable for stock in its younger stage, but soon becomes very harsh, and inclined to overrun much hillside country.

(10) *Eragrostis elongata*, a love grass.

(11) *Calotis lappulacea*, burr daisy. This and other species of calotis are commonly called bindy-eyes but this local name is now applied very commonly in Queensland to a number of burr plants.

(12) *Siegesbeckia orientalis*, commonly called farmer's lice, a very common weed of cultivation, sometimes seen on hillside pastures. It is of no particular consequence, and would not be very aggressive, we should think, under your conditions

(13) *Arundinella nepalensis*, a reedy grass, very common on hillsides in Queensland. It is too coarse to be of much value as a fodder, but is not an aggressive species in the same way as the aristidas or wire grasses

(14) *Malvastrum spicatum*, a very common weed of the mallow family.

(15) *Grewia latifolia*, a moderately common plant in Queensland, particularly on hillside country. In North Queensland an allied species is used as a cure for diarrhœa and dysentery, it is said, with very good results. Probably the leaves of the present species would have much the same effect. It is not known to possess any poisonous or harmful properties, but we have never seen cattle eat it, at least to any extent.

Bottle Tree Caustic.

Inquirer (Mitchell)—

Your specimen is the bottle tree caustic, *Euphorbia eremophila*, a very common weed in many parts of Australia, and stretching in Queensland from the coast right on the sea-beach to the far west. It is generally regarded as poisonous to stock, particularly sheep, though ordinary paddock stock do not seem to eat the plant to any extent, and most of the trouble from it has been with travelling stock, or freshly untrucked sheep. The symptoms described are similar to those of the ordinary scrub caustic (***Euphorbia Drummondii***). The head and neck of affected sheep swell very considerably, and if the swelling is pierced an amber-coloured fluid exudes, and the life of the sheep may be saved.

Feather Top Grass.

J.H.F. (Columboola)—

Your specimen is *Chloris virgata*, commonly known as feather top, or woolly top Rhodes grass. This grass is very widely spread over the tropical and subtropical regions of the world, and is quite common in many parts of Queensland, particularly as a weed of cultivation. It is very common in the lucerne-growing areas of the Lockyer Valley, and is said to have seriously decreased the earning capacity of some of the lucerne fields. It is a luscious-looking grass, but stock do not take very readily to it, though they are said to eat it freely in the form of hay. It is barely worth cultivating, as, on the whole, where it grows Rhodes grass can be grown equally well, and is a better fodder.

Annatto and Clitorus: Ornamental Shrubs.

T.H. (Maclean, N.S.W.)—

Your specimen represents *Bixa Orellana*, the Annatto, a native of tropical America, but now widely cultivated as an ornamental shrub in many tropical and sub-tropical countries. The seeds are contained in a prickly pod, and the red covering that surrounds them is exported from some countries for the purpose of colouring butters and cheeses. Annatto is particularly used for this purpose in Continental Europe, where a demand for a highly-coloured butter or cheese exists.

We do not know where you could obtain seeds of *Clitorus*. They do not seem to be regularly stocked by seedsmen here. The plant is quite naturalized about Townsville, and is seen everywhere on the hills about the town. Perhaps the Curator, Botanic Gardens, Townsville, might be able to supply you with some. We occasionally have a few on hand, and will remember your request.

Grasses from the Mid-west Named.

A.M.H. (Chinchilla)—

1. *Chloris virgata*—feather top or woolly top Rhodes grass. This grass is very widely spread through Queensland, and mostly occurs as a weed of cultivation or where the ground has been disturbed. Although rather luscious-looking, our experience has been, on the whole, that stock do not take to it very readily, although we are told they eat it freely enough in the form of hay.

2. *Echinochloa colona*—barnyard millet or wild millet. This grass is very common in parts of Queensland, and occurs mostly either as a weed of cultivation or in damp places. It is an excellent pasture, and is very closely allied to such well-known cultivated plants as white panicum and Japanese millet.

3. *Eleusine indica*—crowfoot grass, a very common grass in Queensland, mostly occurring as a weed of cultivation.

4. *Rynchelytrum repens*—red Natal grass. This grass is now very widely distributed in Queensland, and occurs mostly either in cultivation lands or where the ground has been disturbed; in some places it has extended into the ordinary pasture. Reports on its fodder value vary, but, on the whole, it is of only secondary value. It is a very common weed on the fruit farms of coastal Queensland, and by itself, and with other fodders, has been found to make excellent chop-chop for working horses.

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A CONVENIENT AND SIMPLE FIRE-STICK.

The following idea for a cheap and effective fire-stick comes from a northern canegrower:—

A 3 to 4-foot length of ½-inch or ¾-inch galvanized piping is plugged at one end with a piece of suitable cloth, to serve as a wick. This may be attached to a length of wire, like a rifle "pull-through," and is so packed that kerosene poured into the pipe just leaks slowly through. The wick is lighted, and the operator walks along the border of the field dropping flame on the trash.

One bottle of kerosene will suffice to burn several acres of trash. It may be used also on weeds and rubbish generally, and its lightness makes it a handy weapon for the reburning of cane tops which have been raked into rows, and which would probably serve to reinfect neighbouring crops with borers were they not destroyed by fire.

E.H.F. in *The Cane Growers' Quarterly Bulletin* (Bur. Sugar Expt. Stations).

General Notes

Staff Changes and Appointments.

Messrs. F. C. J. Jorss, H. Lambert, and R. J. Rollston have been appointed assistant inspecting cane testers for the forthcoming sugar season, with headquarters at Cairns, Mackay, and Bundaberg, respectively.

List of police officers appointed to act also as inspectors of slaughterhouses as from the 8th May, 1937: Sergeant T. G. Long (Redcliffe), Sergeant J. R. Meade (Cooktown), Sergeant J. Rinaldi (Mossman), Constable A. Cox (Yelarbon), and Constable R. V. Walker (Rosedale).

Mr. D. A. Bacon has been appointed an inspector of dairies, stock, and slaughterhouses as from the 17th May.

Additions to the list of honorary rangers under the Animals and Birds Acts:—Messrs. S. R. Prout (Finch Hatton), C. W. Davidson (Carmila), C. A. Atherton (Koumala), F. A. Atherton (Koumala), S. A. Lilliendal (Koumala), J. C. Rasmussen (Mount Convenient, Sarina), E. S. Daly (Ilbilbie) J. Lawrie (West Plane Creek, Sarina), and E. J. Walsh (Shinfield, Sarina).

Mr. L. H. Roles has been appointed chairman of the Isis Local Sugar Cane Prices Board, vice Mr. V. J. Anderson, transferred.

Mr. N. J. King, A.A.C.I., soils survey officer, Bureau of Sugar Experiment Stations, Bundaberg, has been appointed chemist-in-charge, Sugar Experiment Station, Bundaberg.

Messrs. A. J. Hooper (Tourist Officer, Cairns) and M. P. Staunton (Assistant Tourist Officer, Cairns) have been appointed honorary rangers under the Animals and Birds Acts and the Native Plants Protection Act as from the 1st May, 1937.

The following persons have been appointed cane testers for the forthcoming sugar season at the mills indicated—G. E. Becker (Mulgrave), Miss D. Bowder (Marian), T. Breen (Proserpine), T. P. Brown (Mossman), J. Casey (Tully), L. Chadwick (Inkerman), Miss E. Christsen (Mourilyan), L. G. F. Holbach (South Johnstone), C. H. Humphreys (Cattle Creek), C. H. Jorgensen (Kalamia), Miss J. Orr (North Eton), Miss I Palmer (Invicta), W. Richardson (Babinda), Miss M. T. Smith (Plane Creek), G. Tait (Pioneer), F. W. Trulson (Pleystowe), R. D. Woolcock (Racecourse), and V. F. Worthington (Farleigh).

The following persons have been appointed assistant cane testers for the forthcoming sugar season at the mills indicated—Miss A. Anderson (Plane Creek), P. C. Boettcher (Pleystowe), C. Boone (Tully), L. C. J. Clifton (Proserpine), D. M. Corbett (Kalamia), E. J. Delaney (Pioneer), Miss F. Foubister (Proserpine), H. J. Heidke (Pleystowe), H. L. Holthouse (Plane Creek), Miss N. Hooper (South Johnstone), Miss M. A. Lyle (Farleigh), R. A. Mahoney (Marian), V. B. Martin (Racecourse), S. McRostie (Kalamia), Miss M. Morris (Tully), J. H. Murtagh (Racecourse), Mrs. M. E. Nally (Inkerman), Miss E. M. Rowe (Invicta), C. E. Savage (Farleigh), Miss P. Southwick (Babinda), J. Y. Taylor (Marian), D. Walton (Invicta), P. A. Van Lith (North Eton), Miss M. E. L. Wassell (Pioneer), and Miss S. Wilkinson (Cattle Creek).

The following persons have been appointed honorary rangers under the Animals and Birds Acts, as from the 29th May:—Messrs. F. W. Finlay (Riverview), B. G. White (Yimbun), A. Williams (Toogoolawah), T. Helander (Rita Island, Ayr), and J. F. J. O'Connor (Ayr).

Police Constable R. Holben, of Eumundi, has been appointed also an inspector of slaughterhouses, as from 29th May.

Mr. E. R. Gibson, Clerk of Petty Sessions, Mossman, has been appointed also chairman of the Mossman Local Sugar Cane Prices Board and an agent of the Central Board for the purpose of making enquiries with regard to sales and leases of assigned lands, vice J. P. Lee, transferred.

Mr. H. St. J. Pratt, Instructor in Fruit Culture, Department of Agriculture, Stanthorpe, has been appointed Senior Instructor in Fruit Culture.

Constable W. E. Lynam, Tinana, and the non-commissioned officers in charge of the police at Longreach, Aramac, Barcaldine, Isisford, Jundah, Muttaburra, and Tambo, have been appointed also inspectors under the Brands Acts.

The following have been appointed also inspectors under the Slaughtering Act:—Constables W. H. Anger, J. T. King, and J. H. Sprenger (Longreach); W. C. C. Sprenger (Aramac); W. C. Cutler (Alpha); J. F. O'Connor (Barcaldine); R. J. Cowan (Blackall); W. Mollenhauer (Isisford); V. C. Mahoney (Jericho); C. R. G. Thomson (Tambo); R. P. Hagarty (Windorah); and I. E. B. Wardrop (Winton).

Mr. G. H. Jenkins, M.Sc.App., B.Sc., A.A.C.I. Fairymead Sugar Co., Bundaberg, has been appointed assistant mill technologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock. Another appointment to the Bureau of Sugar Experiment Stations is that of Mr. H. G. Knust, of Tully, who will fill the position of instructor (sugar cane culture).

Mr. H. M. Groszmann, Assistant to Horticultural Research Officer, Department of Agriculture and Stock, has been transferred to Nambour.

The following transfers of Inspectors in the Department of Agriculture and Stock have been approved:—Mr. S. C. Smith, Inspector of Slaughterhouses and Dairies, from Cairns to Mackay; Mr. J. R. Canty, Inspector of Slaughterhouses and Stock, from Innisfail to Cairns; and Mr. J. T. Littleton, Inspector under the Stock, Slaughtering, and Dairy Produce Acts, from Brisbane to Innisfail.

Appointments of honorary rangers have been made as follows:—Mr. E. M. Bauer, Molle Islands, Proserpine, honorary ranger under the Animals and Birds Acts; Mr. S. Zlotkowski, Ashra Downs, Muttaburra, honorary ranger under the Native Plants Protection Act; and Mr. O. J. S. Craig, 'Bunya Tavern,'' Bunya Mountains, via Dalby, honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. W. Booth, of Bebo, via Yelarbon, has been appointed an honorary inspector of Stock, and Constable A. Still, of East Bundaberg, an inspector under the Slaughtering Act and the Brands Acts.

Sugar Cane Assessments.

An Order in Council has been issued under the Regulation of Sugar Cane Prices Acts fixing the general assessment for the Sugar Cane Prices Fund on all sugar cane produced in Queensland during the coming season at 1¼d. per ton. In addition, special assessments are levied on cane supplied to the Mossman, Pioneer, and Inkerman Mills for the purpose of checking by survey the assigned sugar-cane lands in those districts in accordance with *''The Regulations of Sugar Cane Prices Acts Amendment Act of* 1931.'' These special assessments are at the rate of 1d. per ton in the case of Mossman, and ½d. in the case of Pioneer and Inkerman Mills.

Local Butter Marketing Scheme and Equalisation System.

An Order in Council has been passed amending the constitution of the Queensland Butter Board with regard to the Local Marketing Scheme and Equalisation System. Previously, if moneys held by the Board and urgently required by the factories were to be distributed, the distribution had to be effected on the basis of sales over a period of twelve months preceding the distribution, that is, on the basis of sales not made within the period during which the new marketing arrangements have operated. The present amendment now enables the Board to distribute moneys which belong to the factories as they become available, and on the basis of sales within periods during which such moneys have been accumulated. Also, the Board has been empowered to take action in the case of refusal or omission to furnish returns of sales to the Board.

Wild Life Preservation—New Sanctuary Near Rockhampton.

An area of about 3,600 acres of land on Hedlow Creek (parish of Barmoya, county of Livingstone), owned by Mr. M. C. Beak, Sandringham, Green Lake road, via Rockhampton, has been declared a sanctuary under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

Northern Pig Board Levy.

The Governor in Council has approved of the issue of Regulations Nos. 508 and 509 under the Primary Producers' Organisation and Marketing Acts, empowering the Northern Pig Board to make a levy on growers at the rate of sixpence (6d.) for each pig delivered to the board during the period from the 1st March, 1937, to the 31st December, 1940, to provide for the administrative expenses of the board. The amount of the levy will be deducted by the Northern Pig Board from payments due by the board to growers concerned.

Hereditary Unsoundness of Stallions.

Regulation 3 under the Stallions Registration Acts has been amended to include "Cryptorchidism" in hereditary unsoundness list for stallions.

Banana Levy Regulation Amendment.

A Regulation issued under the Fruit Marketing Organisation Acts in August, 1936, empowering the Committee of Direction of Fruit Marketing to make a levy on bananas marketed in Queensland, has been amended to provide that the Commissioner for Railways may collect the levy on account of the Committee of Direction on any Consignments of bananas to Brisbane.

Wild Life Preservation.

An Order in Council has been issued under the Animals and Birds Acts, declaring "Braeside," Dalveen, the property of Mr. G. C. Cory, to be a sanctuary for the protection of native birds and animals.

Bundaberg Cane Growers Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts, empowering the Bundaberg District Cane Growers' Executive to make a levy at the rate of one penny per ton for administrative purposes on growers of sugar-cane in its district.

Peanut Board.

Regulation 158 under the Primary Producers' Organisation and Marketing Acts has been amended to provide for a reduction in the rate of the levy by the Peanut Board from one farthing (¼d.) to one eighth of a penny (⅛d.) per lb.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts giving notice of intention to extend the operations of the Peanut Board for the period from the 28th August, 1940, to the 27th August, 1947. Growers are given the opportunity of forwarding a petition for a poll on the question of whether or not the board shall be thus extended, such to be lodged on or before the 26th July next.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, amending the constitution of the Peanut Board in regard to the tenure of officers of members of the board and the definition of a grower.

The amendments provide for triennial elections and a three years' term of office for all members of the board.

Persons who are deemed to be growers of peanuts and eligible to vote at any election or referendum shall be those who during the preceding twelve months have cultivated peanuts for sale in any part of the State on not less than half an acre of land of which they are owners or tenants under a written lease or agreement, or which they are farming under a written share-farming agreement, and who delivered to the board for sale all the peanuts produced for sale from such land.

District Executives and Sugar Mill Suppliers' Committee.

Regulations under the Primary Producers' Organisation and Marketing Acts embodying fees and allowances payable to members of district cane growers' executives and mill suppliers' committees have been amended to provide for alterations in the scale of fees payable to members of the Maryborough District Cane Growers' Executive and the Mount Bauple Central and Maryborough Mill Suppliers' Committees.

Registration of Veterinary Surgeons.

The Act providing for the registration of all persons engaged in the practice of veterinary surgery is now in operation. All persons who are eligible for registration should apply to the Registrar of the Board, Department of Agriculture and Stock, Brisbane, for the application forms provided by the Regulations, and other particulars.

Rural Topics

Improvements on Small Sheep Holdings.

When money is available a small pastoral holding frequently carries improvements fit for a much larger property. On the other hand, when finance is not available, the small holding often lacks even the bare improvements which are essential to the well-being of the sheep and the handling of the clip.

A holding has a certain capital value, and unnecessary improvements merely over-capitalise the property. Interest has either to be paid or allowed for this excess expenditure.

Certain improvements are, however, essential in all cases.

A substantial boundary fence and, should the district suffer from the depredations of dogs, netting and top netting are obviously necessary.

Next in importance is the water supply. Should there be adequate natural water the selector is fortunate. Failing natural water, wells, sub-artesian bores, surface tanks, or bore drains to conduct supplies from neighbouring bores must be provided. The type of watering facilities to be used is essentially a matter of economics. What pays best, particularly in drought emergencies, should be a guiding principle in the grazier's choice.

A horse paddock and yards for the handy working of house cows require early construction. This paddock should, of course, be handily situated to the homestead and should contain water.

Subdivisions of the property for the convenient working of sheep is seldom given sufficient thought. It involves not only the running of fence lines, but their construction in such a manner that water is easily and continuously available to the stock. The fences themselves should be substantially erected to obviate continuous drafting and boxing. Too much money may be spent in wrongly thought out subdivisions, but generally speaking, the smaller the paddocks the better. The posts used for fencing should consist of timbers proved in the district for their durability.

The shearing shed and drafting yards may, on a small holding, be lumped together. The shed should be well constructed and properly designed, but not larger than is desirable for the competent handling of the numbers ordinarily run on the property. The yards also should be constructed substantially, and their correct design for the drafting of sheep is of first importance. Where shed and yards are together the latter should be so placed that the shed can be conveniently filled with woolly sheep.

Finally, the situation of the house should permit the easy working of the property, and its cost should be no greater than the improved value of the holding warrants.

The Importance of Washing the Udder.

An essential feature in clean milk or cream production is the thorough cleaning of the cow's udder before each milking. Clean water and cloths should always be available for this purpose in the milking shed, and a few crystals of Condy's crystals should be added to the water used.

If this precaution is taken the milk will not be contaminated with cow's hair, scaly material, dirt, soil, &c. Materials of this type carry innumerable germs which rapidly increase and produce early deterioration in the milk or cream.

During cream separation the dirty grey or brown slimy residue in the bowl indicates the extent to which the cream is affected.

When clean milking is practised and the milk is strained through cotton filter discs into clean utensils, the slime in the separator bowl will be almost white and the cream is relatively free from dirt carrying undesirable bacteria.

Scores of tests carried out by the methylene blue test which is the best known factory method for differentiating between clean and unclean milk, clearly show a very marked improvement in the quality of milk where the udder has been washed.

Dirty milk may contain from 4,000,000 to 20,000,000 bacteria per cubic centimetre, whereas this number can be reduced to less than 500,000 per cubic centimetre by taking care that the udder, hands, utensils, &c., are thoroughly clean.

A great proportion of inferior cream is caused by bacterial contamination due to the omission of three most important processes—thorough washing of the udder of the cow and the milker's hands, thorough scalding of all utensils after each milking, thorough cooling and mixing of cream.

Nutritional Requirements of Poultry.

Poultry raisers as a whole have a very fair idea of the principles and practice of feeding, and take into consideration factors that make for efficient and economic production.

The present day values of cereals may induce some to depart from old and accepted practices in order to reduce costs. There are three points, however, that must not be lost sight of if the best results are to be obtained and the general health of the stock maintained, viz., the vitamin content of the ration, the protein content, and the quantity supplied.

Vitamins.—Vitamin A is of outstanding importance at the present juncture, for a shortage in the ration may cause outbreaks of nutritional roup as well as lowered egg production. The feeding of yellow maize and green feed ensure a sufficient supply of this vitamin. The price of maize will, however, preclude its inclusion in the ration to the same extent as in past years. Wheat will be used to replace this cereal, and so one source of vitamin A is lost.

On most poultry farms during the winter months, green feed is not plentiful, consequently under normal circumstances the loss due to a shortage of maize cannot be overcome. It is, therefore, of paramount importance that the poultry raiser should make a special effort to supply the birds with good succulent green feed. Green feed is the cheapest form in which the birds' requirement of this vitamin can be supplied. In cases where home-grown green feed cannot be obtained, poultry raisers should use at least 10 per cent. of good green lucerne chaff or meal in the mash fed to their birds.

Protein.—To obtain the maximum economic production, laying birds should have in their ration (i.e., grain and mash) a total of approximately 15 per cent. of crude protein. Maize has about 10 per cent. and wheat about 13 per cent. of protein. Where maize has been used extensively and is replaced with wheat it may be desirable to reduce slightly the protein content of the ration. This is most easily brought about by a slight reduction in the meat meal fed.

Generally speaking, however, the protein-rich meat meal is not overfed, and its greater use is advisable in certain circumstances. This is particularly so in the case of the poultry raiser who feeds extensive quantities of skim milk to his birds. With the approach of winter the milk supply will probably diminish. In such cases, the loss of protein of animal origin in the form of milk should be supplemented with meat meal.

Quantity.—Providing the right kind of food is being used, economic production is only possible by feeding the birds all they will consume. Do not be afraid of making your birds unduly fat. The good producer will convert the food supplied in excess of body requirements into eggs. Birds which cannot do this should be culled and sold for table purposes.

Beef Cattle Management.

Extensive canning operations are in progress throughout the major meatworks in Queensland, and they furnish an excellent opportunity for the cattle-man to practise rigorous culling. All aged animals of either sex, speyed cows, and beasts of an unfit type, including calves, should be marketed.

The remaining stock should be regarded as "chiller" grade animals. Rigorous culling will lessen the demands on the available feed, and young steers will, therefore, have a better opportunity to develop normally. Similarly, the breeders will have a better chance of producing healthy calves.

The practice of handfeeding any but valuable stock would soon prove ruinous on a large holding, and even on a small property, where mixed farming is carried on, the beef animals must come last on the list of stock eligible for supplementary concentrate rations.

On most runs there is one objectionable feature which should receive attention, and that is unclean water. Clean water must be protected by fences, or by drawing off into troughs. Even the approaches should be stoned or corduroyed. Foul or extremely dirty supplies should be fenced off, or at least partly purified, by the liberal use of burnt lime or fresh ashes.

A stock lick is a great help to cattle on most Queensland properties. No elaborate preparation is required. Equal parts of salt and bone-meal make a suitable mixture. Where heavy consumption makes the expense unduly high, the bone may be partly replaced by old wood ashes. A regular inspection is advisable so that steps may be taken to remedy any fouling of the mixture.

Our Untold Timber Wealth.

What Ivor Brown says in the following extract from an article in "Wood," a forestry magazine published in England, should have an especial appeal for Queenslanders:—

"The case for knowledge, whether it is knowledge of roots or rocks or bees or butterflies, is not that your head is thereby stuffed with a paper army of Latin names; for that kind of ornithology or botany I have no use whatever. Collecting eggs, skins, fossils, and dead flowers, and labelling them with the utmost correctitude is a dreary and very often a sadly destructive pastime. True knowledge of natural history has nothing to do with pedantic collection and possession; it is the information which leads to understanding and opens your eyes as you take a country or suburban walk or even a stroll in the city park, the information which enables you to comprehend why such and such a flower or tree is found in this or that place, its particular function in the natural scheme, its beauties, and its utilities.

"The case for intelligent instruction of children in the nature and quality of our native timber is overwhelming. I say "intelligent" instruction because this kind of teaching can be desperately dull; it should be kept as far as possible from the examination syllabus, the prize for quick responses, and the honour that goes to the ready rattle of a list of names. It should be based not only on the picture-book and the text, but on the actual growth of the roadside, the playing-field, and the adjoining country. If such teaching is given by lively minds, it must add enormously to our comprehension of England, not only of our legacy of English beauty but to our understanding of social developments.

"Timber, the first material of manipulative man, the especial foundation of our island-story, the oaken face that launched a thousand ships, the buried forests of the coal-measures, the chair we sit on and the desk we write on, the visual glory of our plans and parklands and the pit-prop yielding conifers and cover of our foothills—what was I ever taught about all that? Yes, there was one thing. The English yew and the English bowman. How curious that education should select one aspect of England's timber story which has left the least mark! The record, for example, of the English oak and its manifold usages in ship and house building as well as for furnaces and for furnishing would sum up a considerable fraction of the English heritage. But it was always the yew.

"Education has marched, since I was learning all about Virgil's woods and unable to recognise my own. It does, I believe, place far less reliance on the twigs of the birch and on the slender form of imported timber which bears the name of rattan. I trust that its notions of natural history have equally progressed since I, as Bughunter, loafed among the woods I could not name and did not appreciate or understand. If there ever was a subject which could be made to fascinate an intelligent boy or girl and lead him or her on to the enjoyment of the rural scene and to lively social speculation, it is the nature of our British woodlands and their relation to our earth, our climate, the beauty of our land, and the history of its people.

ANNUAL SCHOOL OF INSTRUCTION FOR DAIRY AND PIG FARMERS.

Preparations for the school of instruction for dairy and pig farmers, which is held annually at the Queensland Agricultural High School and College, Lawes, are in progress. This year the school will open on Monday, 23rd August, and conclude on Saturday, 4th September. The fee is £3 10s. for the full course, and will cover board, lodging, and instruction (and excursion). Concession fares will apply to rail travel. Early application to the Principal, Queensland Agricultural High School and College, Lawes, Queensland, is advised.

Students travelling by rail should book to Lawes, noting also that express mail trains do not set down or pick up passengers at that siding. Further information may be obtained direct from College or from the Department of Agriculture and Stock, Brisbane.

Orchard Notes

AUGUST.

THE COASTAL DISTRICTS.

IN many centres the bulk of the citrus fruits, with the exception of the late-ripening varieties, will have been harvested, and cultural operations should be receiving attention.

Trees which show indications of impaired vigour will require a somewhat heavy pruning, both in respect to thinning and shortening the branches. Where the trees are vigorous and healthy a light pruning only will be necessary, except in the case of the Glen Retreat mandarin. The densely-growing habit of this variety leads to a profusion of weak shoots, which, if allowed to develop, will be responsible for overbearing and resultant small and inferior fruit at an early age.

Where trees show signs of failing, investigations should be made at or near ground level for the presence of collar rot. The roots should be examined for disease, and in the North Coast districts for the presence of the citrus root bark channeller. A light application of paradichlorobenzene buried a few inches deep in circular drills around the tree and with the surface stamped firmly has been recommended for controlling this pest. The distance between the circular drills should be not more than 18 inches, and care should be taken to prevent the crystals of paradichlorobenzene from coming into contact with the roots. It may be necessary to repeat the application after an interval of three or four weeks.

Where it is necessary to control black spot, melanose and scab, the fungicide should be applied at the correct time. The control measures recommended are-

For Black Spot.

Bordeaux of 3-2-40 strength or Bordeaux of 3-2-40 strength + 1 per cent. of oil emulsion—

(1) As soon as the fruit has set;

(2) About a month to six weeks later;

(3) If black spot has been serious previously, another application just prior to the February rains.

For Melanose.

The use of a similar fungicide—

(1) Immediately the fruit has set;

(2) A month to six weeks later, or more often if the weather conditions are exceptionally wet.

For Scab.

(1) Bordeaux mixture 6-4-40 or Bordeaux 6-4-40 + 1 per cent. oil emulsion immediately before the new growth commences; this will help to clean up fungus on the old scabs;

(2) Bordeaux 3-2-40 or Bordeaux 3-2-40 + 1 per cent. oil emulsion at about the middle of the flowering period; this and subsequent applications are for the protection of young foliage and fruit;

(3) Bordeaux as soon as the fruit has set;

(4) If the season is exceptionally wet, it is advisable to give one or two further applications in order to keep the young fruit and foliage well covered.

Where for any reason healthy trees of vigorous constitution are unprofitable, they may be headed back—in fact, have the whole of the top removed—leaving a few selected arms. All other branches should be cut away at their source of origin. The three or four remaining arms, whose lengths will vary from 2 to 4 feet, will form the future framework of the tree. Care must be taken to cover the whole of the exposed bark with a suitable coating of whitewash to prevent sunburn. The numerous shoots which will grow from main arms are suitably reduced, leaving from two to four on each arm. Under favourable conditions these will be in a fit condition to receive selected buds from desirable trees by the following autumn.

It is desirable that, when shoots intended for budding have attained a length of from 6 to 9 inches, their terminals should be nipped off in order to stiffen their growth and guard against the possibility of damage by strong winds.

Fertilizing should be completed as early as possible, the mixture for the spring application being high in readily available nitrogen. Ploughing should then be completed, the depth of this being regulated by local conditions and the nature of the original preparation of the land. Following upon the ploughing the land should be worked down to a fine state of tilth. On hillside orchards attention should be given to the care of possible storm waters. Cultivation should be so arranged as to form shallow drains or banks along the tree rows and across the heaviest slope, leading into suitable side drains which may be grassed to prevent erosion.

The planting of trees may be continued and, with the exception of custard apples, expedited. The attention of citrus growers should be confined to varieties suited to their local conditions.

The pruning of grape vines should be completed, and where cuttings for planting are required these should be selected, trimmed, and heeled-in in slightly dry soil. Canes intended for cuttings should not be allowed to lie about and dry out, but should be treated the day they are severed from the plant. Cuttings are frequently made of excessive length; however, from 10 to 12 inches is a suitable length which allows for insertion in the soil so as to permit of the top bud, with a short section of the internode, protruding above the surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. When there are indications of the swelling of the buds, the time is opportune for wroking over unprofitable trees, where the stock is reasonably vigorous. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and whether any effort is being made towards raising a local supply of nursery stock.

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CHEEPLY MADE RUG FOR DAIRY COWS.

As a means of assisting the dairy cow to conserve heat (and thus preventing food wastage), the rugging of the animals during at least a portion of the winter is well worth while, especially in colder districts and situations. Many farmers would like to rug their cows, yet cannot afford to purchase the market article. The farmer can, however, make his own cow rugs for little more than the cost of the bags, a ball of twine, and a sewing needle, plus his own ingenuity.

Two bags (cornsacks or any heavy bags will do), or three for larger cows, will make a nice rug. Split them down the seams and join together and place on the cow. Next cut off a strip from 10 to 18 inches wide so that the rug will not hang too low. This need not be wasted; it is folded, and when sewn to the rug provides the strap for the thighs, this being the only strap used. The front is now fitted by turning up the front corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion which the cow would tread on. The two turned-back portions are then measured and sewn to fit fairly tightly to the cow's neck. The back strap is fitted 12 to 15 inches below the rump level, and the rug is complete.

This home-made rug will keep the cow warm, and after a few days' wear, when the oil, etc., from the cow's body has worked into the rug, it will also be waterproof. The rug can quite easily be slipped off and on over the cow's head, and it is advisable to remove it daily except on rainy or very bleak days. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs.

Farm Notes

AUGUST.

THE most important work during August will be the preparation of the land for all spring-sown crops. The better the cultivation the better the results that can be expected. Potato planting will be in full swing this month, and in connection with this crop the prevention of diseases calls for special attention. Where possible, seed potatoes should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. However, if only large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slaked lime or wood ashes as soon as possible after cutting. If considered necessary to prevent possible infection by scab, potatoes should be treated with hot formalin or acid corrosive sublimate. Details of the method employed may be obtained from the Department. When treatment has not been carried out prior to sprouting it should be delayed until a day or so before planting. Where cut tubers are to be sown, they should be dipped before cutting.

In localities where all danger from frosts is over, sweet potato cuttings may be planted out. This crop deserves more attention owing to its value for both culinary and stock food purposes.

Arrowroot may also be planted this month in suitable localities.

With the advent of warmer weather weed growth will increase, and cultivators will be kept busy in growing crops, and land being prepared for sorghums, millets, maize, cotton, and summer growing crops generally.

THREE DAY SICKNESS.

Three day sickness is a disease of unknown origin, but, like influenza and small pox it is probably caused by a very minute parasite. It first appeared in the Gulf Country about a year ago and may have been introduced to the continent through the accidental carriage of infected insects from countries to the north of Australia.

As the disease spread with great rapidity through the State, and then along the coastal districts of New South Wales in a few weeks, it is possible that some factors other than insects may also play a part in spreading the disease.

The disease is characterised by a high fever which lasts for a day or two. There is a discharge from the eyes and nose, and, in many cases, lameness in one or other of the limbs is marked. The animal shows a disinclination to move. It prefers to lie down in the shade and remain so during the day or so that represents the acute phase of the disease.

Treatment is not necessary and the animals should be left wholly undisturbed, if possible. This, of course, cannot be always carried out, particularly with milking cows which have to be milked twice daily.

Cows in full milk show a marked decline in the milk produced, but the yield usually returns to normal when the animals show signs of recovery or shortly afterwards.

In severe cases, animals may develop a marked weakness in the hind quarters and show difficulty in rising. This symptom is temporary only though it sometimes persists for several days. The animal should then be fed off the ground and turned over from one side to the other two or three times a day.

Redwater has occurred in some of the herds on tick infested country during the three days sickness outbreak and has caused some losses. This is due to the fact that animals on ticky country are normally "carriers" of the redwater organisms. So long as the animal is quite healthy, these organisms are harmless, but immediately there is a weakening of the constitution of the animal, as may occur during three day sickness, they increase in numbers and produce redwater. If this happens, the animal has to receive appropriate treatment.—Dr. JOHN LEGG.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

A BREAKFAST TABLE CONVERSATION.

IT was an hotel in a small country town in the west of Queensland. I sat with a young man on my right. I had never seen him before, and shall probably never see him again. Breakfast is more cheerful with a little conversation than eaten in glum silence. So I made a beginning with the weather.

Pasteur and Lister.

Then changing the subject—"What keeps people in this town out of bed till midnight?"

"The pictures."

"Ah! Was it a good picture?"

"Yes, it was Pasteur."

"That is a good picture. I saw it in Brisbane some time back. I suppose not one Australian in a thousand had ever heard of Pasteur. Listen, I will tell you something. Some years ago a Paris newspaper offered a prize, for which the competitors were to name the ten greatest Frenchmen. Who do you think headed the list; Napoleon, Victor Hugo, General Foch? Not one of these. Louis Pasteur came first. Can you imagine Australians or Englishmen placing a man of science in the first place in such a competition?"

"There lived recently an Englishman who was a firm friend of Pasteur and as great as he. He was Joseph Lister, the discoverer of antiseptic surgery. How many Australians know anything about Lister, except perhaps his name? Pasteur showed us that many diseases are caused by germs; Lister showed us how to keep disease germs out of wounds. If you were thrown off your horse, and broke your leg, and the bone stuck out through the skin, who would save your life after you were taken to hospital? Why, of course, Joseph Lister!"

Children and Milk.

I changed the subject. "I suppose an experienced stockman can tell at a glance whether a mob of cattle is poorly nourished?"

"Yes, certainly."

"Yesterday, I met a mob of small children coming out of school. I looked at them carefully. They were a poor lot; one of the worst I have seen in Queensland. Most of them were too thin, and many of them had legs like broomsticks. This is not the fault of the district, nor do I think it is due to want of money. You can find in this district poor parents who have well nourished children, because they drink plenty of milk, mostly goats' milk. There are plenty of goats here. In a season like this you can get plenty of goats' milk for nothing at all—nothing but a little trouble."

The Small Boy.

On my left sat a boy of four years, very neatly clothed, very well behaved, very quiet. I thought I would give him a turn.

"Yesterday I saw a number of small boys riding bicycles." He responded instantly with a smile.

"I ride a bicycle at home. It has three wheels."

"You will learn to ride on two wheels some day."

The boy's mother was not there. He was in charge of a friend. Just then he asked him what he would have to drink.

"Water," he said.

Better than tea, I thought. But I handed him the milk jug.

"Won't you drink this beautiful milk?"

"No. I like water better."

His guardian said, "You should drink milk. It is so good for you."

Realising the futility of this I kept silent. Then, after an interval—

"Do you play cricket?"

"No."

"What do you play?"

"I like playing tennis."

"You will play better tennis, if you drink milk every day. There is something to think about."

A seed planted by the wayside. I fear it will never sprout.

Balancing the Diet.

(Contributed by the Queensland Nutrition Council.)

A GREAT authority on nutrition after investigating the diets of all types of people, rich and poor, was convinced that the majority of mankind lives on a diet which is defective in some respect. That does not necessarily mean that the majority of people are starving. Many people may and do eat more than enough food of a "kind", yet their diet may be defective in some one type of food constituent, *i.e.* their diet is not well-balanced. For example, in Australia, the people as a whole eat too much sugar and white flour and not enough fruit and vegetables, milk, eggs, and cheese. How then are we to balance our diets? Before we can do this intelligently, we must know something of the different types of food constituents.

Foodstuffs, as commonly used, may contain all or some of the six essentials in any diet, viz.—water, carbohydrates, fats, proteins, minerals, and vitamins.

(1) *Water* is contained in most foods, even in solids, such as vegetables and fruit, bread and meat, while good milk contains about 87 per cent. of water. Water is very essential to a well-balanced diet, and may be taken as "Adam's Ale", when at least six glasses daily would be needed, or in the form of milk, tea, coffee, cocoa or soups.

(2) The next essential is *carbohydrates.* These, together with the fats, provide the body with energy and heat when digested. The carbohydrates should form about two-thirds of our daily food supply and include such substances as potatoes, fruit, vegetables, cereals, rice, sago, flour and sugar. *Bread,* consisting largely of flour, is one of the most commonly used carbohydrate foods; indeed, according to modern knowledge, it is often too commonly used. Wholemeal or cerevite bread should always be used in preference to white—for they are both much richer in the sixth essential—vitamins.

(3) *The Fats.*—The third essential of a balanced diet mentioned above includes such substance as butter, fat of meats, cream, oils and nuts, and here in Queensland should form about one-sixth of the total quantity of the daily food supply. In cold countries, such as Northern Canada, the Esquimaux live almost on seal and the blubber of whale, which consist largely of fat. In tropical and temperate climates, during summer, less fat is perhaps needed than during the winter.

(4) *Proteins* are the fourth essential of a well-balanced diet. These are usually known as body builders or strength producing foods. Meat, fish, eggs, cheese, peas and beans are foods rich in protein and these should form about one-sixth of the daily food supply. They are especially necessary for growing children. Men doing hard manual labour also require a good deal of protein, but the habits of people in Queensland generally ensure a more than ample supply for working men.

(5) The *mineral substances* come next among the essentials. Four important members of these are often deficient in the diet. These are—iron, lime, phosphates, and iodine. Iron is very necessary to keep the blood in a healthy state. Some of the foods which should be taken for their iron content are egg yolk, liver, whole-grain cereals, green vegetables, and dried fruits. Lime and phosphates are very necessary for the proper development of the bones and teeth, and also help in the formation of muscles and nerves. A lack of lime and phosphates in foods leads to many very serious conditions, especially in children. Milk,

cheese, oatmeal, carrots and potatoes are all rich in lime and should be included in the daily dietary. Of these, milk and cheese are especially valuable. For phosphates, foods such as milk, liver, brains, cheese, eggs, fish-roes should have a place in a well-balanced diet. *Iodine,* too, is essential in order to keep the body healthy. In districts where the food contains insufficient iodine, e.g., in certain parts of the Alps and in certain districts of New Zealand, a large percentage of the population develops goitre, a form of swelling in the neck. Oysters, cod-liver oil, eggs, potatoes (with skins on) and leafy vegetables, all contain sufficient iodine for the bodily needs.

(6) Now, the sixth and last essential of a well-balanced diet are *Vitamins,* of which there are many. The most important of these are known as A, B, C, D.

From what has been said, it will be very obvious that milk, meat, eggs, and cheese, fruit and green vegetables, along with wholemeal or cerevite bread, make a well-balanced diet. Attached will be found a table which will be a guide in the choice of foods and, if followed, will provide both variety and balance in the diet. The table:—

BREAKFAST.

Balance Your Meal by having one food from EACH of the four Groups.

(1) Fruit.	(2) Milk.	(3) Cereals and Breads.	(4) Proteins.
Orange Pineapple Apple Pawpaw Bananas Grapefruit Tomato Apricot Peaches Cherries Pears Grapes (Fresh fruit is best, but stewed can be used for a change)	Certified milk Pasteurised milk (Lower grade milks should be boiled before being given to children)	Wheat Germ breakfast meal (*e.g.*, Cerevite) Stoneground wheaten porridge meal Firstbreak wheaten meal Cerevite bread Wholemeal bread Oatmeal (occasionally) ("Prepared" breakfast foods are not economical)	Egg— poached scrambled omelette fried boiled Lamb's fry Kidneys Fish Chops Steak Bacon Ham

LUNCHEON OR LIGHT EVENING MEAL.

Balance Your Meal by having one food from EACH of the four Groups.

(1) Protein Foods.	(2) Salad Vegetables and Fruit	(3) Starchy Foods.	(4) Milk.
Mutton Lamb Beef Cheese Fish Ham Tongue Pork Veal Poultry Rabbit Pea soup Nuts	Lettuce Tomato Celery Apple and cheese Beetroot Pineapple and cheese Onion Shredded raw carrot Radishes Fresh fruit (as for breakfast)	Potato (boiled in jacket) Cauliflower Cerevite bread Wholemeal bread Macaroni	As for breakfast, Milk soup

DINNER.

BALANCE YOUR MEAL BY HAVING ONE FOOD FROM **EACH** OF THE FOUR GROUPS.

(1) Protein Foods.	(2) Starchy Foods.	(3) Vegetables.	(4) Dessert.
As for lunch	Potatoes— boiled in jackets baked mashed Other starchy foods, as for lunch	Cabbage Lettuce Spinach Silverbeet Onions Carrot Cauliflower Tomatoes Parsnips Turnips Pumpkin	Fruit salad Pineapple Stewed fruits Custard made with milk and eggs

Australia, in fact the whole civilized world, is becoming nutrition-minded. Let us here in Queensland keep abreast in the forward march and introduce into our own homes a well-balanced diet. In this way, we may help materially in the building up of a strong and stalwart race, surpassing even our present high standard.

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IN THE FARM KITCHEN.

PUDDINGS AND SAUCES.

When the cold weather has whetted the appetite, hot steamed puddings become popular items on the menu.

The puddings described here are suitable for this time of the year, and not the least attractive feature of many is the unusual sauce which accompanies them.

Plain Foundation Pudding.

Take 6 oz. flour, 1 teaspoonful baking powder, ½ gill milk, 2 eggs, 3 oz. sugar, 2 oz. butter, pinch salt, vanilla.

Beat the butter and sugar to a cream. Add eggs and beat well. Add milk and vanilla gradually. Lastly add the sifted flour and baking powder, and stir very lightly. Place in a greased mould covered with greased paper and steam for one and a half hours.

To make this into a Marguerite pudding, put a little jam in the bottom of the mould before filling in the mixture.

For a lemon pudding, add the grated rind of a lemon.

Sultanas, dates, currants, may be added. These give the pudding its distinctive name.

Marmalade Pudding.

Take 2 oz. butter, 2 oz. sugar, 4 oz. flour, ½ teaspoonful carbonate of soda, 1 egg, 2 tablespoonfuls milk, 2 tablespoonfuls marmalade.

Cream the butter and sugar. Add the marmalade, beaten eggs and milk, then stir in the sifted flour and carbonate of soda. Pour into a well-buttered mould, cover with greased paper, and steam for about one and a half hours. Serve with marmalade sauce.

Delaware Pudding.

Take 10 oz. suet crust, 2 oz. chopped peel, 2 tablespoonfuls breadcrumbs, 1 large apple, 1 tablespoonful dates, or currants, 2 tablespoonfuls syrup.

Grease a pudding basin. Roll crust out thinly, and cut into varying rounds to fit and fill a pudding basin. Chop the apple. Mix all the ingredients together with enough syrup to make the mixture spreadable. Grease the basin and fill it with alternate layers of pastry and mixture. Have the last layer of pastry. Cover with a floured cloth. Steam for two hours. When turned out, coat with syrup flavoured with lemon juice to taste.

Ginger Pudding.

Take 3 oz. breadcrumbs, 3 oz. margarine, 2 eggs, 3 oz. brown sugar, 3 oz. flour, 1 tablespoonful preserved ginger, 1 teaspoonful baking powder, 2 tablespoonfuls ginger syrup, milk.

Rub the margarine into the flour. Stir in all the other dry ingredients, the chopped ginger and ginger syrup. Moisten to a thin batter with eggs and milk, if required. Grease a pudding mould, turn the mixture into it. Cover with greased paper. Steam for one and a half hours. Serve with ginger sauce or custard sauce.

Sweet Carrot Pudding.

Take 1 lb. carrots, ½ lb. breadcrumbs, 1 egg, 2 oz. butter, 1 oz. brown sugar, salt, lemon sauce.

Scrape the carrots, put them into boiling water, and cook until soft. Rub through a sieve. Add the breadcrumbs, sugar, butter, pinch of salf, sufficient beaten egg to bind well together. Butter a pudding basin, put in the mixture, and steam for about one hour. Turn out the pudding and serve hot with lemon sauce.

Heredotus Pudding.

Take ¼ lb. breadcrumbs, ½ lb. suet, ½ lb. raisins, 2 figs, ¼ oz. allspice, 1 egg, 1 oz. sugar, ½ lemon, 2 tablespoonfuls sherry.

Chop the suet finely and the figs. Cut the stoned raisins in half, and mix all the dry ingredients together, with the rind of a lemon grated. Beat the egg well and add it, and if necessary sufficient milk to make into a dough. Put into a buttered basin, cover with a scalded and floured cloth. Steam for four hours, and serve with sherry sauce, made by mixing half a pint of water with half an ounce of cornflour into a smooth paste, and then boiling it with an ounce of castor sugar for five minutes, stirring it all the time. A glassful of sherry can be added after it has boiled.

Steamed Victoria Pudding.

Take 8 oz. self-raising flour, 4 oz. suet, pinch salt, 1 bare teacupful water, 1 cooking apple, 2 tablespoonfuls apricot jam, sugar if liked.

Mix the flour and finely chopped suet together with a pinch of salt. Grate the apple, cut up the cherries, and add to the mixture with the jam. Mix with the water into a paste. Put into a greased basin and steam for two hours.

Lemon Sauce.

Take ½ pint boiling water, 1 lemon, 1 oz. loaf sugar, 1 dessertspoonful cornflour.

Rub the sugar on the lemon until the actual rind is removed. Dissolve this in the boiling water and simmer gently. Mix the cornflour into a smooth paste with a little cold water. Add some of the warm mixture to this, then pour all back into the saucepan, stirring it continually until it boils. Add the lemon juice and serve.

Cabinet Pudding.

Take 2 cupfuls breadcrumbs, 1 egg, ¼ pint milk, 1 tablespoonful sugar, ½ cupful raisins and currants, a few crystallised cherries.

Stone and cut up the raisins; make a custard with the egg and the quarter pint of milk and the sugar. Butter a mould, put a few glace cherries at the bottom, then put a layer of breadcrumbs, and after that a layer of the dried fruit, and go on doing this until there are no more ingredients left. Then pour in the custard and steam gently for half an hour. Serve with a lemon sauce, made by boiling half a pint of water and a cupful of sugar to a syrup, with the juice and rind of one lemon. Thicken it with three tablespoonfuls of cornflour and stir in a tablespoonful of butter before serving.

Verney Pudding.

Take 4 oz. flour, 2 oz. sugar, 3 oz. butter, 2 eggs, 1 tablespoonful jam, ½ teaspoonful corbonate of soda.

Beat butter and sugar to a cream, add eggs, and beat thoroughly, add jam, stir in the flour and carbonate of soda, put into a greased mould, cover with a greased paper, and steam one and a half hours. Turn out and serve with jam sauce.

Sago Plum Pudding.

Take 3 tablespoonfuls sago, 1½ gills hot milk, ½ cupful breadcrumbs, ¾ cupful stoned raisins or sultanas, ½ cupful sugar, 2 oz. butter, 1 egg, ½ teaspoonful carbonate of soda, toffee sauce.

Wash the sago and strain it. Pour the hot milk on the sago and let it stand for three hours. Add the raisins to the sago with breadcrumbs, sugar, and butter. Put the mixture into a saucepan and heat it till the butter is melted. Beat the egg with the soda and stir it in. Pour it into a mould which has been well greased, and twist a greased paper over the top. Steam for two hours. Leave the pudding for three minutes before turning out. Pour toffee sauce round and serve.

Toffee Sauce.

Take 2 oz. butter, ¼ lb. golden syrup, ¼ lb. brown sugar.

Melt the butter and add the sugar and syrup, stir till it boils. Boil it for fifteen minutes. Stir till it begins to thicken, and pour it quickly over the pudding.

Sweet Sauce.

Take 1½ teaspoonfuls cornflour, 1½ teaspoonfuls castor sugar, ½ pint milk, flavouring to taste.

Mix the cornflour to a smooth paste with some of the milk. Heat the remainder and stir it on to it. Return it to the saucepan, bring it to the boil, and simmer for a few minutes, keeping it well stirred all the time. Add the sugar and flavouring and pour the sauce round the pudding.

Apricot Jam Sauce.

Put 1½ tablespoonfuls of apricot jam into a saucepan with ¼ of a pint of water. Boil it for a minute or two and use. A squeeze of lemon juice or a spoonful of sherry may be added.

Orange Sauce.

One large juicy orange, 2 oz. sugar, 6 drops cochineal.

Squeeze the orange juice on to the sugar. Dissolve the sugar slowly and boil it for eight minutes. Add the cochineal.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1937.	May, 1936.
North Coast.	In.		In.	In.
Atherton	2·28	36	1·42	3·47
Cairns	4·56	55	2·61	4·81
Cardwell	3·64	65	2·64	3·51
Cooktown ..	2·85	61	0 62	3·28
Herberton ..	1·75	51	1·27	1·60
Ingham	3·66	45	2·27	2·69
Innisfail	12·58	56	8·59	14·49
Mossman Mill ..	8·95	24	1·53	4·09
Townsville ..	1·29	66	0·18	0·54
Central Coast.				
Ayr	1·12	50	0·24	0·10
Bowen .. .	1·30	66	0·17	0·38
Charters Towers ..	0·79	55	0·03	0·38
Mackay	8·82	66	0·92	4·09
Prosperine .	4·36	34	1·27	2·61
St. Lawrence .	1·77	66	0·06	2·65
South Coast.				
Biggenden ..	1·70	38	0·28	1·59
Bundaberg .	2·59	54	0·52	2·91
Brisbane .. .	2·74	85	0·25	1·14
Caboolture ..	2·80	50	1·24	3·82
Childers	2·11	42	0·61	2·28
Crohamhurst ..	4·80	44	0·54	4·42
Esk	1·90	50	1·73	0·71
Gayndah	1·57	66	0·06	1·91
Gympie	2 79	67	0·51	1·71
Kilkivan	1·82	58	0·02	2·80
Maryborough ..	2·99	66	0·26	2·95
Nambour	4·68	41	0·94	5·34
Nanango	1·51	55	0·31	0·96
Rockhampton ..	1·61	66	0·09	1·06
Woodford	2·84	50	0·47	2·48
Central Highlands	In.		In.	In.
Clermont ..	1·26	66	Nil	1·03
Gindie .	0·88	38	..	1·04
Springsure .	1·23	68	0·30	1·08
Darling Downs				
Dalby .. .	1·29	67	0·08	0·49
Emu Vale .	1·13	41	0·29	0·56
Hermitage .	1·13	31	..	0·32
Jimbour .	1·20	49	0·20	0·31
Miles	1 45	52	Nil	0·15
Stanthorpe ..	1·81	64	0·34	0·82
Toowoomba ..	2·13	65	0·66	0·43
Warwick ..	1·50	72	0 29	0·71
Maranoa				
Roma ..	1·36	63	Nil	0·26
State Farms, &c.				
Bungeworgorai ..	0·85	22	..	0·06
Gatton College ..	1·58	38	0·32	0·62
Kairi .. .	2·06	21	..	..
Mackay Sugar Experiment Station	3·37	40	0·59	3·32

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MAY, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·96	81	72	83	9, 11, 18	61	27	62	3
Herberton	..	75	54	82	14, 16	45	27	127	8
Rockhampton	30·07	82	59	90	16	47	19	9	2
Brisbane	30.10	76	55	84	1	49	19	25	5
Darling Downs.									
Dalby	30·09	74	45	81	6	34	18	8	2
Stanthorpe	..	68	35	75	2, 6	26	18	34	4
Toowoomba	..	70	46	76	2, 7 25	35	18	66	4
Mid-Interior.									
Georgetown	30·00	87	56	91	10, 11, 14	·49	14	Nil	..
Longreach	30·07	83	50	90	15	40	28	Nil	..
Mitchell	30·12	76	40	83	6, 7	29	19	Nil	..
Western									
Burketown	29·99	87	61	93	11, 25	53	19	Nil	..
Boulia	..	83	53	95	15	45	18, 30	Nil	..
Thargomindah	30·08	75	48	88	6, 7	39	19	Nil	.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

					MOONRISE.	
	July. 1937.		August. 1937.		July. 1937.	Aug. 1937.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.45	5·7	6.35	5·21	12·1	1·4
2	6·45	5·7	6·34	5·22	—	2·8
3	6·45	5·7	6·33	5·23	1.3	3·11
4	6·45	5·8	6·33	5·24	2·7	4·9
5	6·45	5·8	6·32	5·25	3·13	5·2
6	6·45	5·8	6·31	5·25	4·21	5·51
7	6·45	5·9	6·31	5·26	5·25	6·33
8	6·45	5·9	6·30	5·26	6·23	7·11
9	6·44	5·9	6·29	5·27	7·13	7·47
10	6·44	5·10	6·28	5·27	7·58	8·22
11	6·44	5·10	6·28	5·28	8·38	8·56
12	6·44	5·11	6·27	5·28	9·15	9·32
13	6·43	5·11	6·26	5·29	9.47	10.9
14	6·43	5·12	6·25	5·29	10·25	10·50
15	6·43	5·12	6·24	5·30	10·58	11·31
						p.m.
16	6·43	5·13	6·23	5·30	11·32	12·17
					p.m.	
17	6·42	5.13	6·22	5·31	12·12	1.7
18	6·42	5·14	6 21	5·31	12·52	2·0
19	6·42	5·14	6·20	5·32	1·36	2·56
20	6·41	5·15	6·19	5·32	2·24	3·52
21	6·41	5·15	6·18	5·33	3·15	4·49
22	9·41	5·16	6·18	5·33	4·7	5·49
23	6·40	5·16	6·17	5·33	5·7	6·48
24	6·40	5 17	6·16	5·34	6 3	7·48
25	6·39	5·17	6·15	5·34	7·0	8·48
26	6·39	5·18	6·14	5·35	7·58	9·52
27	6·38	5·18	6·13	5·35	8·56	10.56
28	6.38	5·19	6·12	5·36	9·55	..
						p.m.
29	6·37	5·19	6·11	5·36	10·56	12·2
30	6·36	5·20	6·10	5·37	11·58	1·4
31	6 35	5·21	6·9	5·37		2·3

Phases of the Moon, Occultations, &c.

1st July ☽ Last Quarter 11 3 p.m.
8th „ ● New Moon 2 13 p.m.
15th „ ☾ First Quarter 7 36 p.m.
23rd „ ○ Full Moon 10 46 p.m.

Perigee, 6th July, at 7 p.m.
Apogee, 18th July, at 8 p.m.

Mercury will on the 8th arrive at that part of its orbit where it will be beyond the Sun from the Earth. More than 137 million miles separating us at this time from the "Inferior Planet" revolving, like Venus, inside of the Earth's orbit.

On the 18th Saturn, in Pisces, will be stationary—apparently—since dire results would follow were motion to cease but for a moment among the host of heavenly bodies. It is explained that when the Earth, as seen from a "Superior Planet," has reached its furthest distance east or west of the Sun the planet, as seen from the Earth, will seem at rest, because for a short period we will move either directly towards or away from it, after which the planet will resume its normal eastern or, apparently, western course

Mercury, on its swift journey around the Sun in a quarter of a year will from the beginning of the month travel through the constellations Gemini and Cancer then, crossing the borderline into Leo will there, on the last day of the month, be in close vicinity to Regulus, less than half a degree from this first magnitude star on the ecliptic. They may be seen near the western horizon soon after sunset.

Mercury rises at 6 7 a.m., 38 minutes before the Sun and sets at 4.27 p.m., 40 minutes before it on the 1st, on the 15th it rises at 7.18 a.m., 35 minutes after the Sun, and sets at 5.45 p.m., 33 minutes after it.

Venus rises at 3 17 a.m., 3 hours 28 minutes before the Sun and sets at 2.11 p.m., 2 hours 56 minutes before it on the 1st; on the 15th it rises at 3.26 a.m., 3 hours 17 minutes before the Sun and sets at 2 7 p.m., 3 hours 5 minutes before it.

Mars rises at 1.37 p.m and sets at 3.9 a.m. on the 1st; on the 15th it rises at 12 48 p.m and sets at 2.25 a.m.

Jupiter rises at 6.9 p m. and sets at 7.50 a.m. on the 1st; on the 15th it rises at 5 9 p.m. and sets at 6.50 a.m.

Saturn rises at 11.37 p.m. and sets at 11.43 a.m. on the 1st; on the 15th it rises at 10.43 p.m. and sets at 10.48 a.m.

The Southern Cross will be upright about 6 p.m. and on its side at midnight on the 1st but two hours earlier at the end of the month.

6 Aug. ● New Moon 10 37 a.m.
14 „ ☾ First Quarter 12 28 a.m.
22 „ ○ Full Moon 10 47 a.m.
29 „ ☽ Last Quarter 9 55 a.m.

Perigee, 3rd August, at 2 p.m.
Apogee, 15th August, at 1 p.m.
Perigee, 29th August, at 1 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate; as the relative positions of the sun and moon vary considerably.

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15-9-37

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

The Sugar Situation.

IN the course of a recent address to his constituents at Mackay, the Premier, the Hon. W. Forgan Smith, LL.D., said the world, from a sugar point of view, differed from what it had been some years ago. Prior to the war Great Britain grew little sugar except experimentally. To-day, under a system of bounties, Britain was producing a fourth of her requirements. That bounty was frequently in excess of the value of the sugar produced, or 100 per cent. more on the world value of sugar at certain times. That policy was introduced in order that Britain would not have to depend entirely on other countries for the whole of her food supplies. Soviet Russia, which previously was not a big producer of sugar, would have 3,000,000 tons this year, a large proportion of which would be exported, though the people, if given an opportunity, would be well able to consume it all. In other industries excess production brought down the value of the goods actually sold, and that was the position in the sugar industry; so the recent international conference had to find a way by which production could be controlled in the free market and that market supplied only with what it was able to absorb. The agreement provided for an expanding share of the free market; thus if consumption increased there Australia would be entitled to a proportionate share of such increase.

The peak year scheme adopted by the canegrowers of Queensland in 1929 provided for 611,428 tons, that being regarded as the economic limit of production owing to the uncertainty of markets overseas. With the quota now received and a protected market for five years, he suggested that the peak could be increased by 100,000 tons, making it 711,428 tons. It would mean that this quantity would be in No. 1 pool, which included Australian consumption plus the 400,000 tons Australia was permitted to export. If more than that were produced, it could be treated as excess sugar, as at present. This did not involve any increase in the total production of sugar-cane over what had been produced last year or this year.

Queensland's Agricultural Advantages.

FUNDAMENTALLY the things which counted in successful agriculture were water, soil and climate. All these advantages Queensland possessed in a remarkable degree, said the Minister for Agriculture and Stock, the Hon. Frank W. Bulcock, in the course of an address to farmers recently.

Continuing, he remarked that many had noticed that the House of Commons had adopted a measure for the development of agriculture in Great Britain. They might think that this was of small moment to agricultural industries in Australia or to themselves, but if they analysed the motive underlying the British plan they would find that it was designed to stimulate production along more efficient lines. It was proposed under this plan to make a charge of not more than £7,000,000 per annum to topdress agricultural land and improve the various branches of British agriculture.

As the British policy aimed at efficiency in agricultural production, so they should endeavour to promote efficiency in their own primary industries. Industries were governed by many factors, not the least of which was economics. They knew as growers that the economics of the sugar industry were such as to cause them a good deal of perplexity.

Mr. Bulcock reminded the gathering that in addition to making plans to compete on an equal footing with others in the United Kingdom they should not neglect their home market. Australia imported about 500,000 tons of agricultural products, all of which could be grown in Queensland.

"Those who are prepared to face facts must realise one thing," said the Minister. "That is that the expansion of the sugar industry is going to be slow and we must necessarily extend our other production so that we might justify our right to the land we now hold. To grow crops with the greatest efficiency we must provide for the vicissitudes of the weather."

Mr. Bulcock added that irrigation entered largely into the question of providing permanent water. He had received 100 different suggestions for schemes ranging from one based on the old Chinese system of drawing water from a bucket and dropping it on the ground to one involving the use of the most modern irrigation plant. At the same time, he suggested that irrigation was one of the most intricate problems connected with agriculture. Irrigation schemes would have to be worked out by the producers, financiers, technical men, the Government and probably the local authorities.

North Queensland—A Land of Opportunity.

ON his return to Brisbane from a tour of North Queensland, His Excellency the Lieutenant-Governor, Sir James Blair, said that he regarded the North as a land of opportunity, by reason of its magnificent resources. It was a rich region offering bright prospects for young, vigorous, earnest men not afraid of hard work and with a will to succeed, if they would go out and seek to establish themselves on the land. For the land-minded the opportunities were unlimited.

It was sometimes asserted that the North was not a place for white people. He wanted to challenge that. In cities, townships, and scattered areas of settlement he had visited all the schools, and had been impressed with the splendid health, physique and mentality of the children. They lacked nothing in comparison with the children of less tropical regions. Adults and children were a testimonial to the climatic conditions and the general suitability of the North to white settlement and development.

Rural Trends.

PRIMARY producing countries, like Australia, would eventually be faced with declining markets for their products, said Dr. Edmund Brunner, Professor of Education in the Teachers' College of Columbia University, New York City, in the course of a recent public address in Brisbane. Speaking on "Rural Trends," he said one of the most important trends of the present century was the urbanward drift of population. It dated from the beginning of the modern industrial era, but had become especially pronounced in the last half-century. In Australia the strictly rural population was less than two-fifths of the total, the metropolitan almost 47 per cent.

The farm family had a unity and cohesiveness that had never been equalled by the urban. Its sharply lower divorce rates showed this. The farm family was bound by a single interest—the co-operation of man with animals and plants in the task of helping to answer the world's prayer for daily bread.

The urban world must find solutions for its problems; the rural world must adjust itself to them. Educationally at least this adjustment had been but poorly made. It was charged, and with some justice, that the rural school trained its children away from the soil and toward the city. So in America they began to teach vocational agriculture and tried to keep rural youth in rural areas.

The interests and thoughts of rural men and women had broadened. Increasingly rural people had sought to understand the forces that baffled them. Increasingly they had sought outlets for expression in drama, in community service, in recreation.

Not all the changes had been losses, and over and above trends in organisation, in social and economic life, the rural people seemed to be taking a place of new importance in a society that was becoming increasingly interdependent.

It was the task of education to watch the more important trends and be ready to see the implications they held for the service they could give to the citizens of to-morrow, in order that some day the sun might rise on a world that knew the peace, the serenity and the satisfaction that to-day was found chiefly in the countryside.

The Treatment of Tobacco Seed-Bed Covers to Prolong their Useful Life.

J. H. SIMMONDS, M.Sc., Senior Pathologist, and L. F. MANDELSON, B.Sc.Agr., Agricultural Research Officer.

FOLLOWING on the announcement by the Council for Scientific and Industrial Research[1] that blue mould of tobacco could be effectively prevented in the seed bed by subjecting the seedlings to the vapour of benzol, the Department of Agriculture and Stock initiated experiments to ascertain how this new method of control could be adapted to Queensland conditions. Amongst other things a cheaper means of enclosing the gas than the standard cold frame was sought. A satisfactory method was found to be the provision of a calico tent fitting tightly over solid triangular ends and a wooden border along each side. In earlier work the calico for these tents and for the covers of experimental cold frames was treated with linseed oil as recommended by May[5] in New South Wales and later used by Angell, Hill, and Allan[1] in their experiments on the vapour treatment of seedlings. This was assumed to be necessary for the dual purpose of making the cover more translucent and more gas-tight. It was soon found that linseed oil possessed two distinct disadvantages. The calico was rendered very brittle and easily torn, and mould growth was intensified to such an extent that insufficient light was allowed through. Moreover, linseed oil is an expensive preparation to use. It therefore appeared that one way to cheapen the initial cost of the benzol method would be to find a suitable substitute for the oil treatment, and some attention was accordingly given to this line of investigation.

Methods Employed.

Altogether fourteen different materials or combinations were tried as calico dressings. These are listed in the summary on page 113. Four different experiments were involved in testing them. In two of these the treatment of the calico was carried out in the laboratory. Portions of each of the treated pieces were then removed and wrapped up together in a piece of badly mildewed canvas and the whole left moist. This ensured a rapid development of mould on those pieces not adequately protected and allowed a quick estimate to be made of the relative value of the treatments used. A second portion was tested under conditions conforming more to seed-bed practice. The piece of calico was either hung from a horizontal wire over an old tobacco seed-bed (first series) or used as a cover for a small cold frame (second series). The other two experiments consisted of field trials at Gayndah and Miriam Vale, in which entire seed-bed covers of the tent variety were treated and compared. R. A. Tarrant and N. E. Goodchild of the Agricultural branch were responsible for the work entailed in these field experiments.

Some of the treatments were tested in all four experiments and others of less promise in only one or two. No essential variation was noted in the relative merit of the same treatment throughout the experiments. A difference did occur, however, according to the length of exposure. A tabulated summary of the observations made will be found on page 113. The relative strength of the material was judged on an entirely arbitrary standard by the simple process of noting the ease with which it could be torn by the hands. As it was first assumed that some form of gas and waterproofing was necessary, estimates of the relative waterproofing qualities were obtained by noting the time taken for equal quantities of water to percolate through a standard depression made in the calico tied over the mouth of a jar.

Discussion of Results.

Although these experiments were not by any means extensive, several interesting facts were demonstrated. In the first place, it was found that special proofing of the calico is unnecessary, and a mildew preventive is all that is required. As evidence for this conclusion the following facts may be cited. Not more than a 5 per cent. variation from the mean occurred in the total evaporation over 28 days when equal quantities of benzol were used in frames covered with calico treated with Shirlan, alum-lead acetate-glue size, Shirlan followed by soap-alum-gelatin, linseed oil, Shirlan followed by linseed oil, Shirlan followed by linseed oil in petrol, and Shirlan followed by paraffin wax in petrol. No differences were noted in the efficiency of blue mould control in any of these frames and the growth of the seedlings was similar throughout. The rate of diffusion of benzol through calico subjected to several of these treatments was the same for all, when once they had been exposed to the weather for some time, but in calico freshly oiled it was reduced to about one-half.

SUMMARY OF DATA REGARDING CALICO TREATMENTS BASED ON THE RESULTS OF FOUR EXPERIMENTS.

Material.	Mildew development		Loss of Strength.	Water-proofing.	Interpretation of symbols.
	3 Months.	6 Months.			
					Mildew Development.
					— Nil.
Untreated calico	+ + +	+ + +	—	+ + + +	+ Slight (no importance).
Alum. Lead acetate ..	+		+	+ + + +	+ + Moderate.
Alum. Lead acetate + glue size	+	+ + +	+	+ +	+ + + Serious.
Shirlan NA. (W.S.) 1% ..	+		+	+ + + +	+ + + + Very serious.
Shirlan AG. 1%	+	+ + +	+	+ + + +	
Shirlan AG. Alum + soap + gelatin	+	+ + +	+	+	——
Copper sulphate. Soft soap	+		+	+ +	*Loss of Strength.*
Paraffin wax in petrol ..	+ + + +		+ +	+	— Nil compared with untreated.
Shirlan A.G. Paraffin wax in petrol	+ +	+ + + +	+ +	+	+ Slight (no importance).
Raw linseed oil	+ + + +	+ + + +	+ + + +	+	+ + Moderate.
Shirlan AG. Linseed oil ..	+ + + +	+ + + +	+ + + +	+	+ + + Serious.
Shirlan AG. Linseed oil in petrol (1 to 2)	+ + + +	+ + + +	+ + + +	+ + +	+ + + + Very serious.
Proprietary mildew preventive	—		+ +	+ + + +	——
Proprietary waterproofing material No. 1	+ +		+ + +	+	*Waterproofing.*
Proprietary waterproofing material No. 2	+ + + +	+ + + +	+ + + +	+	+ Good.
					+ + Moderate.
					+ + + Slight.
					+ + + + Nil (similar to untreated).

One point strikingly demonstrated was that linseed oil is unsatisfactory in all combinations, since it intensifies mildew development and renders the fabric very brittle. The possible inclusion of this oil in the preparation of the two proprietary waterproofing materials used may have accounted for their poor showing. Paraffin wax dissolved in petrol, while excellent for waterproofing purposes, is also conducive to mildewing and tends to weaken the material.

A mixture containing paraffin wax, petroleum jelly, boiled linseed oil and mineral turpentine, similar in composition to proprietary waterproofing compound No. 2, has been recommended by Sharp[6] in Western Australia, but it evidently would be unsatisfactory under Queensland conditions.

The Shirlan-alum-soap-gelatin[3] combination proved a good waterproofing material without possessing the disadvantages of those containing paraffin, but the extra cost involved precludes its use for seed-bed covers where a high degree of proofing is apparently unnecessary.

One proprietary line containing copper napthenate gave good control of mildew in preliminary trials but was not further investigated on account of its high cost. The copper sulphate-soft soap application resulted in a bluish coloration of the calico, which was considered a disadvantage.

Two of the dressings were sufficiently satisfactory, when all aspects are considered, to merit their recommendation. These are the alum-lead acetate and Shirlan treatments. Although effective for several months, neither of these prevents mildew indefinitely, and, unless something better is discovered in the meantime, it may be necessary to renew the treatment each year. The alum-lead acetate method possesses the advantage of being somewhat cheaper, but is more cumbersome since it entails immersion in two separate solutions. However, further investigations may show that these can be combined into one without loss of efficiency. The details of these two methods are given below.

Alum—Lead Acetate.

The formula used for this dressing is based on one recommended by Holden[4] and was brought under notice by H. E. Young, Assistant Plant Pathologist. A modification simplifying the preparation and allowing for the addition of glue was suggested by N. E. Goodchild, but has not been fully investigated.

Two solutions are necessary, one of alum and another of commercial lead acetate (sugar of lead). The method of preparing 5 gallons of each, and the procedure entailed, is as follows:—

1. Place 1 lb. alum in 1 gallon of boiling water and stir until dissolved. Then add this solution to 4 gallons of cold water, making 5 gallons in all.

   Soak the calico in the alum solution for one day, kneading it well so as to ensure thorough wetting and to remove the sizing material from the cloth.

2. Place ½ lb. lead acetate in 1 gallon of boiling water and then stir until dissolved. Add this solution to 4 gallons of cold water making a total of 5 gallons as before.

   Remove the material from the alum solution when the required time has expired and wring lightly. Then soak it in the lead acetate solution for from 5 to 6 hours. Remove, wring lightly, and allow to dry.

The cost of the materials used in making up the two solutions of 5 gallons each is approximately one shilling at wholesale rates.

If it is desired to add some slight waterproofing properties to this dressing, ¼ lb. glue size or gelatin may be dissolved in a small quantity of the water heated for the purpose and added to the lead acetate solution.

Shirlan.

Shirlan is the proprietary name for a chemical substance which was first used and manufactured in England for restricting mildew development in cotton and woollen cloth. Later it was also found useful as a fungicide for certain plant diseases. Cunningham[2] reports that Neil in New Zealand has found the water soluble form of Shirlan to be effective in protecting the canvas of tents against mould attack. In the experiments reported here an insoluble form known as Shirlan AG. was chiefly used. This consists of 25 per cent. salicylanilide together with a wetting and spreading agent. It may be obtained in Queensland at a cost of 9s. per 2 lb. tin.

For calico treatment it is recommended that the Shirlan AG be added to the required amount of water at the rate of 1 per cent. by weight. That is to say, ½ lb. of Shirlan AG. (one-quarter of a 2-lb. tin) is required for 5 gallons of water. When bought, the Shirlan may have settled hard in the tin and some care will be necessary to ensure that it is all stirred up before removing the quantity required. The calico is immersed in the mixture and kneaded well so as to ensure thorough wetting and to remove the sizing material. After it has been soaked for half-an-hour or so the cover can be hung out to dry.

As mentioned before it may be necessary in the case of both dressings to repeat the treatment each season in order to compensate for the leaching effects of heavy rain.

In putting down the seed-beds sufficient space should be left to enable the covers, when removed for ventilation, to be laid back to dry if necessary. Rolling the covers up tightly when they are wet with dew and rain, and leaving them thus for long periods, is very conducive to mildew development.

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◆

DIGESTIVE DERANGEMENTS IN HORSES.

Most derangements of the digestive organs of horses are due to errors in diet, and a good and regular system of feeding will do more to prevent digestive disease than anything else.

The following rules for feeding are generally accepted as correct:—

Water before feeding, and not for at least an hour after.

Feed in small quantities, and often.

Do not work hard immediately after a full feed.

Never give a horse large quantities of food to which it is not accustomed.

If these rules are followed, and care taken to ensure that only sound, good food is fed, very little trouble will be experienced.

The Avocado.

R. L. PREST, Instructor in Fruit Culture.

HORTICULTURALLY the avocado is a comparatively new fruit, particularly to Queensland. Its native home is generally conceded to be tropical America. Botanically the avocado is related to the laurel family, and early classification placed all varieties in one species, *Persea americana*. More recent studies, however, have resulted in making two distinct species, *P. americana* and *P. drymifolia*, the former including all varieties horticulturally grouped in the West Indian and Guatemalan races, and the latter including the small-fruited varieties of the Mexican highlands. The characteristics of these three races are—

(*a*) *West Indian race.*—Summer and autumn ripening, fruit large, with skin 1/16th to ¼ inch thick and leathery;

(*b*) *Guatemalan race.*—Winter and spring maturing, fruit large, with skin 1/16th to ¼ inch thick and woody in texture;

(*c*) *Mexican race.*—Leaves small and anise scented, fruit small and thin-skinned.

The tree is an evergreen, though some varieties shed nearly all their foliage for a brief period during flowering. The leaf blades are of many different shapes, e.g., oval, ovate, obovate, lanceolate, and elliptic, and in length they vary from 3 to 16 inches. The colour of the mature foliage is usually a bright green, and young foliage may exhibit various shades of red and bronze. The manner of growth of the trees varies considerably; the tall upright unbranched habit and the small well-branched spreading habit are both commonly met with.

The fruits in the cultivated species are extremely variable in size, shape and colour. In shape they may be round, oval or bottle-necked, or in any of the numerous graduations between these forms. The colour ranges from light yellowish-green through dark green, maroon, brown and reddish-brown to purplish black. The skin of the Mexican varieties is thin, whilst that of the Guatemalan varieties is thick, tough and even woody.

The edible portion of the avocado is the fleshy part lying between the skin and the seed, and is of a buttery consistency, from creamy to bright yellow in colour and often greenish near the skin. It contains a high percentage of oil. Normally each fruit contains only one seed, the seeds of the different varieties varying considerably in shape. The seed is inverted in the fruit so that the base is on the side away from the stem end. The seed is often covered with two seed coats of varying thickness.

In addition to being a fruit of merit, the avocado is an extremely nutritious food, and a particularly valuable addition to the dietary of a State such as Queensland with its sub-tropical to tropical climate. In Queensland the avocado is used chiefly as a salad. Because of the high fat content of many varieties, the avocado combines best with such sub-acid fruits and vegetables as oranges, grapefruit, lemons and tomatoes, although some orientals prefer sugar on it instead of an acid substance. Combined with catsup, lemon juice, vinegar or onion, the avocado makes a delicious sandwich spread. It may be served with sliced tomato; or, combined with cabbage, celery, cucumber and onion, it may be used for stuffing whole tomatoes. If preferred sweet rather than with acid combinations, avocado may be combined with apple or banana.

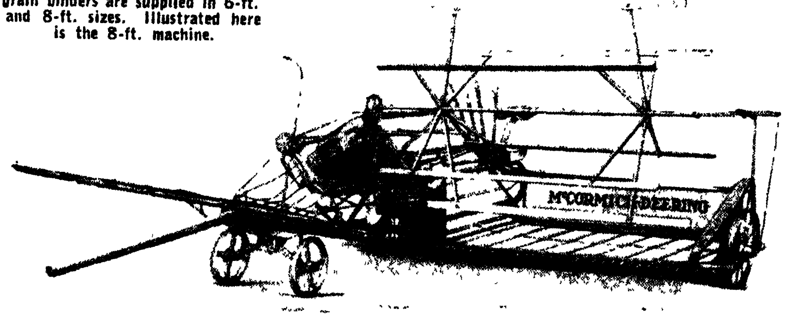
And now . . .

An OIL-BATH Binder

McCORMICK-DEERING

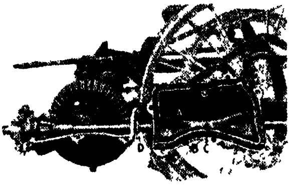
of course!

McCormick-Deering horse-drawn grain binders are supplied in 6-ft. and 8-ft. sizes. Illustrated here is the 8-ft. machine.

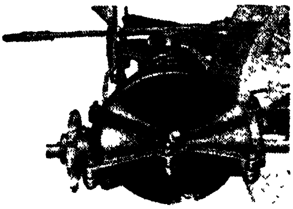


Following the outstanding success of McCormick-Deering oil-bath mowers, International Harvester has pleasure in announcing that all McCormick-Deering horse-drawn grain binders are now equipped with totally enclosed main drive gears which operate in a deep bath of oil.

This new feature, which marks the greatest step forward in the manufacture of binders that has been made for many years, means that dust and dirt are totally excluded from the drive gears, which include the bevel gear and the bevel pinion. The gears operate quietly and efficiently, draught is reduced and the effective working life of the binder is greatly increased.



Showing the position of the enclosed main drive gears on the McCormick-Deering binder. The upper housing, A, has been removed to show B, the felt gasket between the upper and lower housings; C, the location of the screw filler plug in the upper housing; and D, the front felt oil retainer.



The enclosed gear case is made in two halves which fit together with a felt gasket between them, making the case oil-tight and dust-proof. New oil can be added and old oil drained off by removing the screw plugs, top and bottom.

THE GREATEST BINDER VALUE ON THE MARKET.

The application of the oil-bath principle to the main drive gears—the gears which, as everyone knows, do the greatest amount of work on a binder—means that the McCormick-Deering—already recognized as the most outstanding grain binder on the market to-day—now offers the farmer still greater value in the way of efficient operation, long life and satisfactory service. Let your new binder be a McCormick-Deering oil-bath binder. You need one of these modern binders on your farm. Go along to your McCormick-Deering agent and ask him for particulars or, if more convenient, write us direct and we will mail you an illustrated catalogue.

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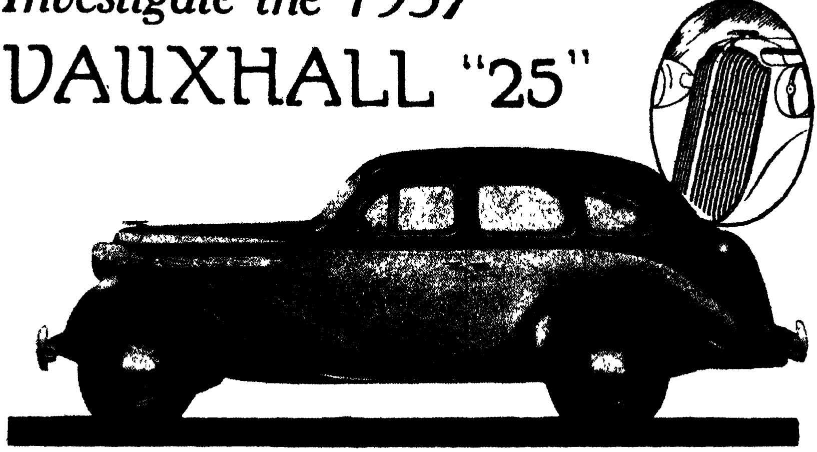
Investigate the 1937
VAUXHALL "25"



—a fine English Car that challenges World competition on every single point.

List all the features you demand in a car, and you will find the Vauxhall 25 incorporates every one. Speed and Acceleration! Hydraulic Brakes! Riding comfort! So you will find it right down your list. Big major features and small refinements—the Vauxhall 25 has them all. Nothing is missing, nothing omitted. Here . . . for the first time . . . are all the features you want . . . in one great, medium-priced English car.

VAUXHALL LEADS—

—IN ENGINE DESIGN.

A 25 h.p. overhead valve engine that sets up new ideals of power and acceleration combined with smoothness and economy—a spirited 80 h.p. plant ready to set you surging forward at a smooth 80 miles per hour should the need arise.

—IN BODY CONSTRUCTION.

Vauxhall's "Unisteel" body by Holden with Turret Top provides greater strength, greater safety, absolute silence, insulation against heat and protection from draught and dust.

—IN CHASSIS SPRINGING.

The Vauxhall 25 incorporates the new "T.T." type of independent springing—as used on the world's most expensive cars. Riding is changed to gliding—and rugged assembly of all moving parts ensures absolute safety and long service.

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A roomy inbuilt luggage trunk, a separate spare tyre compartment, improved no draught ventilation, adjustable driver's seat, dual electric screen wipers, etc., are among the many of Vauxhall's body features.

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Armour plate glass front and side windows, super dual safety hydraulic brakes, low centre of gravity and Unisteel body are among the many safety features offered by Vauxhall.

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Compare the "home" price of the Vauxhall 25 with any other English car on the Australian market, and you will find that Vauxhall's Australian price is nearest of all to the price ruling overseas. This in itself is proof of Vauxhall's great value.

SEDAN AND COUPE MODELS.

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Queensland and Northern Rivers Distributors

NEWSTEAD BRISBANE

Plate 35.
An Eight-year-old Grafted Avocado.

The following are interesting recipes:—

Avocado pineapple salad (Six Servings)—

1½ cups grapefruit sections.
1½ cups orange sections.
¾ cup ripe mango slices.
1 cup avocado slices.

Remove membrane from the orange and grapefruit sections; chill all the ingredients, arrange on lettuce leaves, and serve with French dressing or mayonnaise.

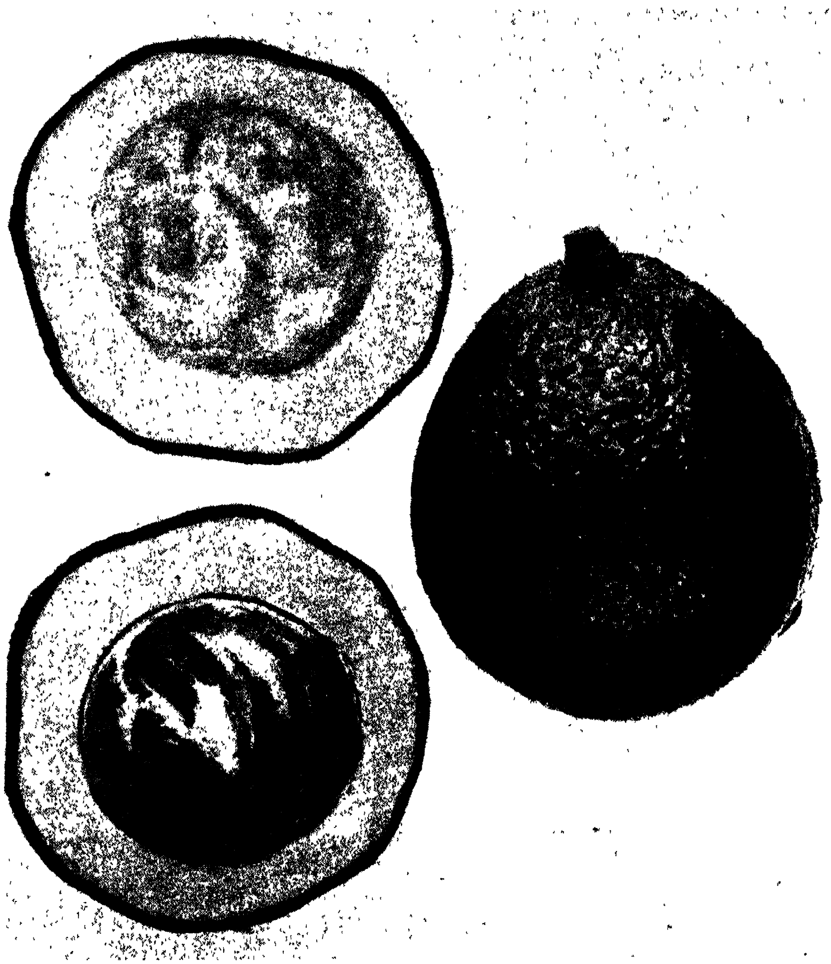

Plate 36.

Avocado Fruit, and Fruit Cut transversely showing Seed in Lower Section

Avocado cocktail (Six Servings)—

4½ cups sliced avocado.
1 cup tomato catsup.
1 teaspoonful finely-chopped onion or juice.
1½ tablespoonful lemon juice.
½ teaspoonful Worcestershire sauce.
½ teaspoonful salt.

Sprinkle the salt over the avocado and chill; combine the other ingredients, chill and pour over avocado just before serving.

Numerous varieties of avocados have been introduced into Queensland, but many have been discarded for various reasons. Trial plots have been planted, and those varieties which promise to be suitable are being worked and kept under observation. Although at present no definite recommendations can be made, intending planters should confine their selection to such varieties as Grande, Queen, Spinke, Blakeman and Wilsonia, which, from the data available, appear to indicate some measure of suitability for the foothills on the North and South Coast of Queensland.

Sown Pastures and their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Agrostologist.

[*Continued from p. 15, Part 1, Vol. XLVIII.—July,* 1937.]

(PART II.)

PASTURE MIXTURES.

AN ideal pasture plant would require, amongst other things, to produce heavily throughout the whole year and to constitute in itself a balanced ration for stock in production. No such plant may be found amongst the common pasture plants, nor, indeed, does any such exist. A near approach to the ideal pasture is attainable in certain areas by sowing a mixture of spring-summer-autumn and autumn-winter-spring growers, clovers or other legumes being blended with grasses.

A word of explanation should be offered here on the value of legumes in mixed pastures. Most dairy farmers and stockraisers know that the major portion of the ration fed to animals should consist of carbohydrates and fats (energy-producing and fat-forming materials), proteins (essential to tissue-building, wool growth, milk production, &c.), and minerals (required for bone formation and other purposes), in proportions which vary with the class of stock fed and the purpose of feeding. In a general way the proportion of proteins to carbohydrates and fats is fairly low in grasses (except in the very young growth) and a pure grass pasture does not provide a properly balanced ration. On the other hand, clovers, lucerne, and other pasture plants belonging to the legume family have a high proportion of proteins to carbohydrates and fats, and these, too, do not form a balanced ration. The requisite proportions of proteins and carbohydrates and fats may be secured in a mixed ration of grasses and legumes, and this is one reason why mixed pastures of grasses and legumes are so desirable. Further, most of the legumes possess a higher proportion of useful minerals than do the grasses and this enchances the feeding value of the mixed pasture generally.

The explanation of the higher protein content of legumes lies in the little growth or nodules which are found on the roots of leguminous plants. Within these nodules occur bacteria which have the power, not possessed by flowering plants, of collecting nitrogen from the air and changing it into a nutrient form. Portion of this transformed nitrogen is taken up by the leguminous plant and built up into proteins, and portion is transferred, either directly or indirectly, to grasses and other non-legumes growing with the legumes. The effect of this supply of nitrogen fertilizing material on grasses is to keep them in a condition of high production (provided other nutrient materials, such as phosphates and potash, are present in the soil in ample quantities), and so the decline in productivity of a pure grass pasture due to rapid depletion of nutrient nitrogen in the soil may be arrested to some extent by incorporating in the pasture a legume which will build up the supply of nutrient nitrogen in the soil by liberating nitrogen taken from the air, and changed into useful nitrogen compounds by the nodule bacteria. Occasionally it is found that lucerne and other legumes when planted on new fertile land in apparently suitable districts do not thrive, and examination shows that the nodules are absent from the roots. In such cases it is necessary to add the requisite bacteria to the seed before sowing, and cultures of these bacteria are prepared for seed inoculation purposes in most States.

From what has already been written it is obvious that mixtures of grasses and legumes provide a better balanced ration than do pastures composed of a single species, and the legumes assist in maintaining the nitrogen content of the soil.

Plate 37.
A freshly-burnt "scrub" area.

Pasture mixtures are desirable also from the point of view of spreading production over the longest possible period of the year. Examples of this are provided by paspalum-white clover pastures (plate 37), where the clover provides grazing during portion of the dormant period of the grass, and by Wimmera ryegrass-lucerne pastures in which the ryegrass is productive during the winter months when the lucerne is at a standstill.

In Queensland, however, the sowing down of mixtures of summer and winter growers is not always successful. Some of our warm season grasses are so aggressive during the wet, summer months that they crowd out most of the pasture plants which are dormant during the warmer period of the year. In addition, the rainfall during the winter months is often too low to permit of the growth of winter-growing pasture plants. However, in some districts the sowing down of winter-growing grasses and clovers in admixture with summer-growing pasture plants is effective in extending the productive period of pasture growth.

On land which varies in soil type from place to place, the sowing down of a mixture of plants is preferable to seeding pure stands, since plants suitable to the different patches are likely to be included in the mixture and a more uniform stand will result.

Simplicity should, however, be the keynote of pasture mixtures. It is usually cheaper, and preferable in most other respects, to sow simple mixtures than to plant complicated mixtures which sooner or later will come to consist of only a few species.

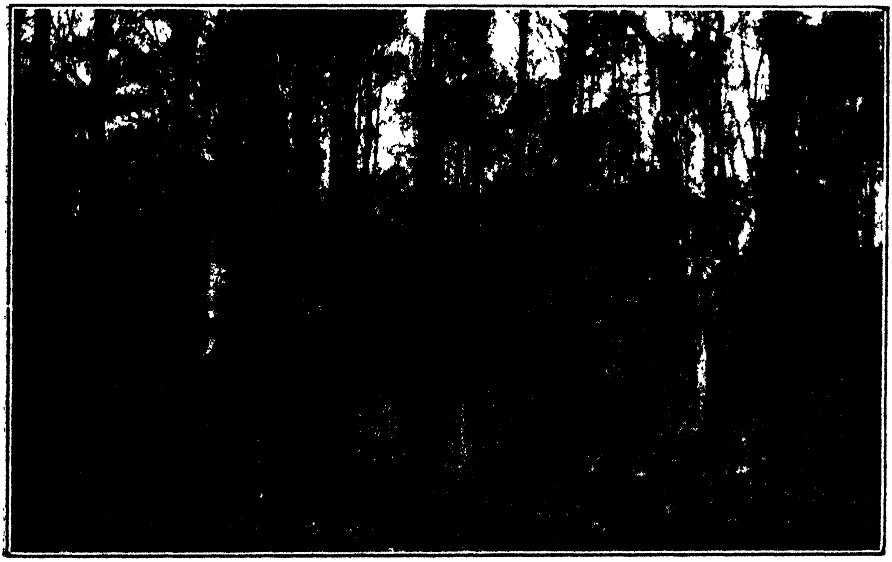

Plate 38.

Sowing Rhodes grass on rotting prickly-pear in brigalow and belah "scrub" in the Maranoa.

SOIL FERTILITY.

A major consideration in the laying down of artificial pastures is the selection of land to be used for the purpose. It is an established fact that pastures make heavy demands upon plant foods contained in the soil, and although a good deal is returned to the soil in the form of animal excreta and plant trash (including decayed roots), much is removed from pasture areas as beef, milk, mutton, wool, &c. Pasture is thus comparable in some respects to harvested crops and, where soil fertility is concerned, should be treated as a crop. In the old agricultural countries, of necessity, pasture has been accorded something approaching crop treatment for years past; but, in Australia, "grass farming" is only now commencing to supersede "grazing" in the more favoured districts.

In view of the high requirements of the better-class pasture plants in respect of foods supplied by the soil, sowings of permanent pastures should be restricted to lands of sufficient fertility to maintain the pastures at a high level of production for several years. As with crop plants, different pasture plants thrive under different degrees of soil fertility. Some demand a very fertile soil; others will tolerate lower fertility conditions. As a general rule, however, the richest soils will produce the best pastures.

Sown pastures are generally established to fulfil one of two conditions, viz:—

(1) To convert virgin timbered country to grazing land within a few months, the settler, pioneering his holding, requiring a cash return within a short period (plates 35 and 36).

(2) To improve timbered, or poorly-grassed, portions of holdings already developed to an appreciable extent, the provision of the improved grazing not being an urgent necessity.

Plate 39.
A mixed paspalum-white clover pasture in the Maleny district.

Where pioneering conditions prevail, the short cut methods of pasture establishment must continue to operate in many instances. Quite apart from the necessity of obtaining pasturage as early as possible, there is justification for the immediate sowing of pasture on freshly-burnt softwood and heavy brigalow scrub areas. Such soils generally are rich in plant foods and the fertility of the land is improved by the addition of ashes from the burnt timber. Moreover, these soils naturally are fairly retentive of moisture. These factors of high initial soil fertility, and abundant moisture content, enable fairly long-lived stands of pasture to be obtained. After some years, however, the initial high fertility of the soil, and its water-absorbing capacity, will have become depleted to some extent and steps will have to be taken, where practicable, to arrest pasture deterioration.

In the case of pasture improvement upon partly-developed properties, a policy of gradually establishing first-class grazing areas should be adopted in preference to one involving the wholesale sowing of

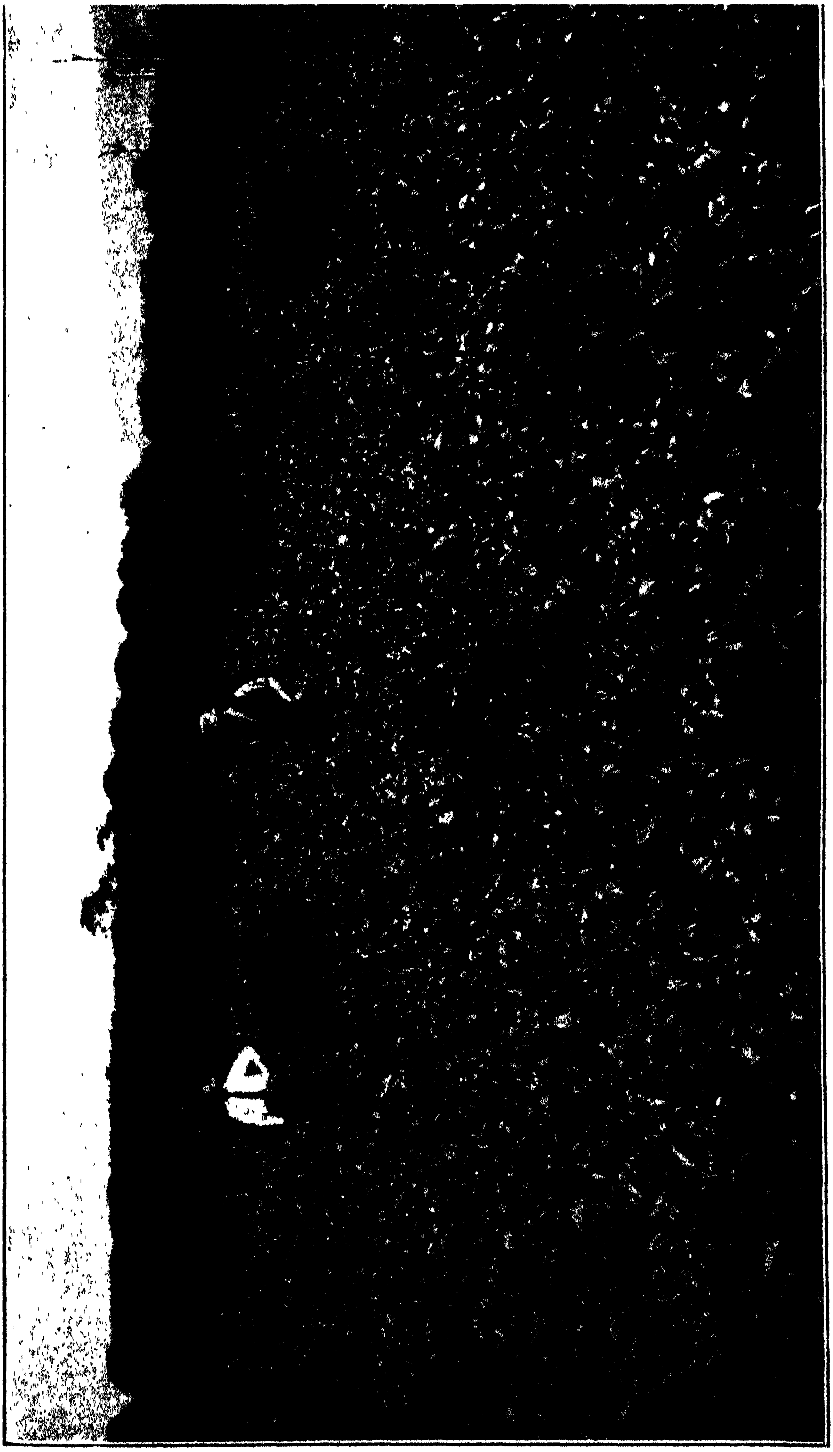

Plate 40.
Cowpeas sown for green manuring purposes.

pastures which will soon become second-class. This applies to the replacement of deteriorated sown and native pastures as well as to the grassing of timbered country. The difference in value between land in first-class condition for pasture, and second-rate land, far outweighs the cost of improving the latter. Naturally, the most fertile areas available on any particular property for pasture sowing should be selected for improvement purposes and the lower class land left alone for the time being. The objective should be efficiently subdivided pastures on fertile, cultivable land which may be cropped and over which a mower may be run.

Methods suitable for bringing various soils into a condition satisfactory for permanent pastures have not yet been worked out in detail for all districts, though much progress has been made in investigations with Rhodes grass pastures at the Callide Cotton Research Station at Biloela. Experience at this centre, and elsewhere, indicates that grass pastures are limited in longevity and productiveness by the supply of available soil nitrates, on which grasses and similar plants are heavy feeders.

The main sources of nitrates in the soil are:—

(*a*) Organic matter, decomposed by the action of certain bacteria with the formation of nitrates, &c., and

(*b*) Nitrogen of the air, converted into nutrient form chiefly by bacteria living in the roots of certain legumes and by a few other bacteria.

The continued production of nitrates from organic matter results eventually in a serious depletion of the organic matter contained in the soil. The effects are a lessened amount of nitrate available to the plants and deterioration in the physical condition of the soil, clay soils setting into hard masses which permit only steady rains to penetrate.

The problem of preparing soils for permanent grass pastures is thus largely one of increasing the nitrate content and the amount of organic matter to a suitable extent. Probably the best means of achieving this are:—

(*a*) Green manuring, both organic matter and available nitrates being increased if a leguminous crop is used for the purpose; (plate 38).

(*b*) Cropping for a certain period with a leguminous cash or fodder crop, such as lucerne or clovers, the nitrate content being increased by the activity of the root-infesting bacteria and the dead roots adding organic matter; and

(*c*) Growing of a row crop demanding relatively little nitrate, the intense cultivation of the soil stimulating the production of nitrates from organic matter already in the soil.

The exact methods that should be adopted have yet to be elaborated for different conditions, but sufficient has been written to indicate that soil fertility is a major consideration in the laying down of pastures.

PREPARATION OF SEED-BED.

Different types of seedbed, varying from uncultivated forest land to the onion-bed type, are employed for sown pastures. The seedbed provided by uncleared forest land, even if some harrowing has been

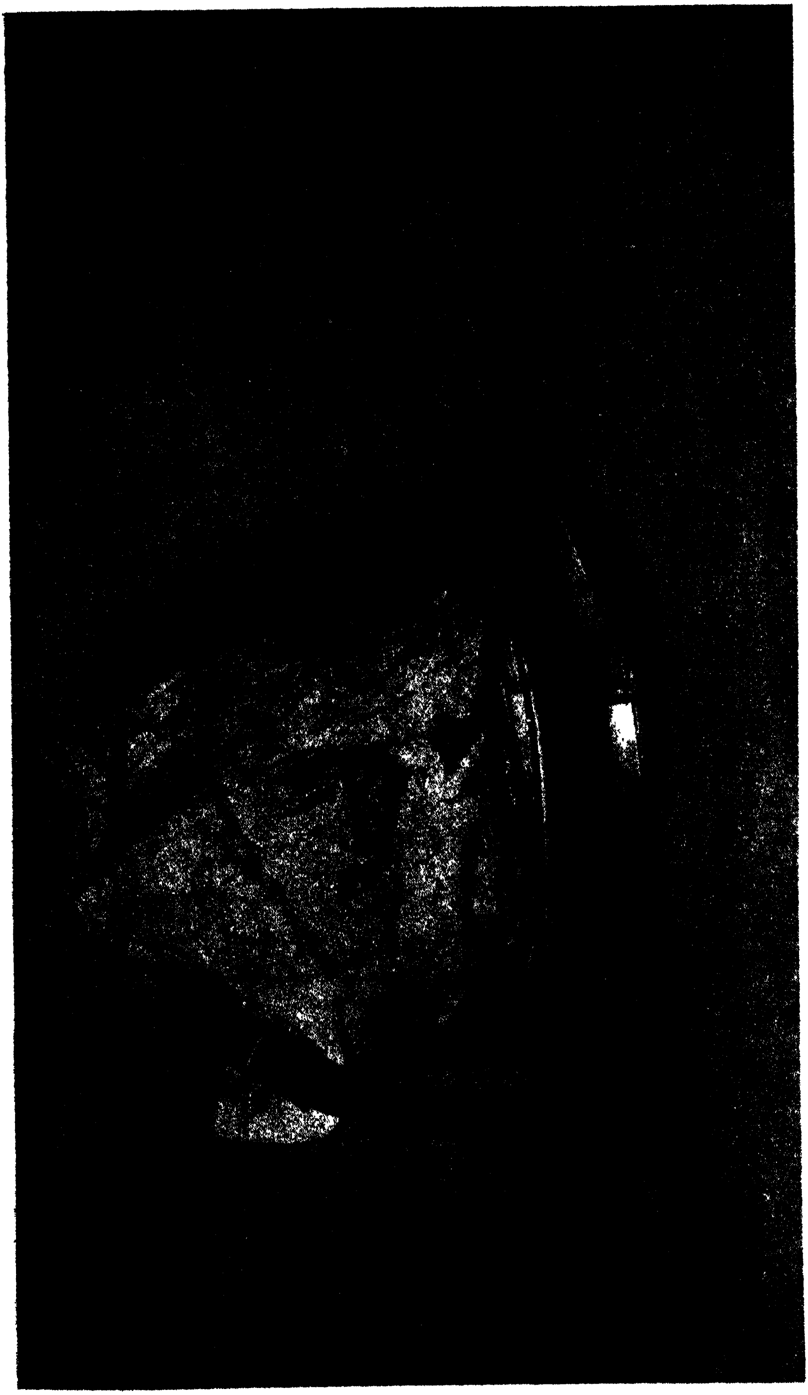

Plate 41.
The fiddle type of seed-sower.

carried out, is quite unsuited for pasture establishment. In addition to the fairly low fertility of the land usually found, the competition of native grasses and undergrowth prevents the satisfactory establishment of sown species. Likewise, established pastures of native or other grasses are not receptive of additional pasture plants unless a disturbed seedbed is provided and a temporary check given to the growth of the established plants by severe harrowing. Under certain conditions wood ashes on burnt-over areas form quite a good seedbed.

Plate 42.
A popular type of hand-operated seed broadcasting machine.

By far the best seedbed is that resulting from the efficient tillage of fertile soil. Most of the common pasture plants have small seeds and require a seedbed of fine tilth. By compacting the soil close to the surface a seedbed is provided which is favourable to the fine, early root systems of the pasture plants. The seedbed should also be provided with ample moisture and in dry districts, particularly, cultural operations throughout the seedbed preparation period should be carried out with due regard to the conservation of moisture. Ploughing well in advance of sowing is desirable, and the land should be allowed to lie in the rough state for a few weeks before further cultivation is undertaken. Heavy peg harrows or a springtooth cultivator will be required to break down the clods. Subsequent working should aim at destroying weeds and compacting the sub-surface soil, and shallow harrowings with the peg harrow or springtooth will assist in this direction. If the land becomes weedy and the surface sets hard, a disc harrow may be necessary to destroy the weeds. Rolling prior to sowing may be desirable in cases where the ordinary cultivation has not sufficed to form a fine seedbed.

If a pasture is to be established from cuttings, plantlets or crown divisions there is not the same necessity for compacting the soil, though moisture conservation, weed destruction and the avoidance of a loose, spongy soil condition are desirable. Under special circumstances the planting of vegetative material may be carried out on rough, and on timbered country, with some prospects of successful establishment, but wherever possible well-worked land should be provided.

METHODS OF SOWING AND PLANTING.

Whilst hand-broadcasting is still the commonest means of sowing pasture seeds in Queensland, the adaptation of drills and manure spreaders for the purpose is now being exploited. Broadcasting seed by hand (plate 36) is fairly satisfactory when carried out on a still day, provided that separate sowings are made of grass seeds and of "shotty" seeds such as those of lucerne and clovers. Hand-broadcasting is the most practicable method of sowing such seeds as those of Rhodes grass and molasses grass. Sometimes it is advisable to mix the seeds with superphosphate or with sand in order to secure a uniform stand. Special hand-operated broadcasting machines (plates 39 and 40) are useful for certain seeds.

Special pasture seed attachments are obtainable for fitting to cereal drills, but are not recommended for use with grass seeds which bunch together. Where the special lucerne and grass seeder is not fitted, pasture seeds of suitable type may be sown through the fertiliser box of the ordinary cereal seed drill. The seed must, however, be mixed with fertiliser or sand, and the mixture constantly agitated. When a drill is used for sowing pasture seeds the discs or hoes should be adjusted to run very shallowly or even along the surface of the land, otherwise the seed will be buried too deeply. Sowing in drills is more economical of seed than is broadcasting.

Manure spreaders can also be utilised for distributing pasture seeds. Where seed is being sown in admixture with fertiliser certain precautions should be taken in order that the viability of the seed may remain unimpaired. Seed should not be placed in close contact with moist fertilisers, and when mixed with dry materials, such as superphosphate, should be sown within a day or two of mixing.

Whilst some seeds may be sown on the surface of the soil and allowed to become buried by natural means, it is generally advisable to cover the seeds immediately after sowing. In addition to bringing the seeds into close contact with the moist soil, covering protects the seed from destruction by birds and ants. In covering small seeds, care must be taken that they are not buried deeper than about one-half inch below the surface of the compacted soil, otherwise the tender shoots may not be able to push through to the surface. If the loose surface mulch is shallow a light rolling or harrowing with light peg or brush harrows is effective in covering the seed, but where the compacted layer is deeper a long-toothed harrow may be necessary. If the surface mulch is too fine and cakes after rain only a very light covering should be given to the seeds. Except on soils which cake on rolling, a light rolling after sowing is often useful in compacting the soil about the seeds. If the soil is somewhat dry a harrowing should precede the rolling. On sheep properties a fairly common method of covering pasture seeds sown on the surface is to run a big mob of sheep over the paddock to trample under the seed, but the stock should not be allowed on the area long enough to consolidate the soil.

Various methods are adopted for planting cuttings, crown divisions or plantlets. The planting material may be "dibbled in" (that is, placed in a hole made with a sharp stick, a hoe or a mattock) or planted in furrows on cultivated land. Whatever type of material is used, the soil must be firmed around the sett by tramping or rolling. Cuttings strike at the joints and should be planted so that at least one joint is below the surface of the soil. The method recommended in South Africa* for planting plantlets and pieces of tufts of plants is as follows: The plants are set out in holes in lines across the field. The holes are made by means of a hoe, the operator walking along the line and making a hole at each step. The correct method of hoeing is to use the hoe with its head at right angles to the line. In planting, the planter works along the line, places the plant against the hard far edge of the hole, fills up the hole and compacts the soil with all his weight on his right foot while putting in the next plant. To avoid setting the plants too deeply the grass should be held from above, but close to the crown, so that the knuckles of the hand are on top of the ground when the plant is being set.

PASTURE MANAGEMENT.

General Principles.

The aims of pasture management are twofold: first to increase the carrying capacity of the pasture to its maximum, and to maintain it at that level; and secondly, to prevent the pasture from deteriorating and, if possible, to improve it. These two aims should be pursued concurrently. The production of animal products, such as wool, mutton, beef, milk or cream should not be made at the expense of the quality of the pasture. The system of pasture management followed should be such as to give due recognition to the demands of both the stock and the pastures.

What is known as the "intensive system of pasture management" embodies all the refinements of good grazing practice, but some modifications are necessary in Queensland. The intensive system, which was evolved in Germany during the great war, employs scientific methods of feeding pasture to stock. The object is systematically to feed off the pasture at the stage of maximum food value, and to accomplish this it is necessary to concentrate stock upon the pastures at many times the normal rate, for periods correspondingly shortened for each paddock.

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* J. A. Pentz: "South African Pasture Grasses together with a Survey of the Work on Prinshof Pasture Experiment Station." Bul. No. 148 of the Union of South Africa Department of Agriculture and Forestry.

This necessitates the provision of a number of paddocks and their rotational grazing. On dairy farms in those countries where, because of regular and uniform rainfall, it is possible to adhere to an orderly plan of rotation, it is usual either to follow the milkers with dry cattle to clean up any rough herbage or to level the rough grass by mowing. Other important aspects of the system are the conservation of the surplus grass produced in the flush of the year, harrowing after grazing to distribute dung, renovating to reinvigorate the pasture, and systematic topdressing with phosphatic, nitrogenous, and potassic manures.

Subdivision of Paddocks.

On many dairy farms it is usual to find a small number of large paddocks rather than a large number of small paddocks. The typical pasture conditions on such farms may be attributed to the lack of sufficient subdividing fences to permit of proper grazing management. Under the existing conditions of poorly controlled grazing the pastures, during the flush of their growth, consist characteristically of a series of closely grazed patches interspersed with rank growth which either is not eaten at all or is left until the following autumn or winter, by which time it has deteriorated greatly in food value. Often more than one-half of the pasture, towards the end of the main growing season, consists of untouched rank growth, and it therefore is easy to visualise the large amount of waste that occurs (The ultimate fate of this excess growth, provided it is not burnt, is to build up the organic matter in the soil, and it is, therefore, not entirely wasted. The practice of adding organic matter, however, is much more effective if undertaken systematically rather than in a haphazard way.) The uneven grazing arises from the cow's preference for the short, leafy grass, which is usually more palatable and nutritious than the same grass when it has become rank and stemmy. When a cow is turned into a paddock which supplies a superabundance of feed she will graze the pasture in patches and will return again and again to these patches, neglecting the overgrown clumps. A similar state of affairs is observed on grazing properties of all descriptions.

As the first step towards keeping the pasture at the short, leafy stage, and ensuring the even grazing of a mixed pasture, it is necessary to provide a series of relatively small paddocks which may be grazed at will according to the stage of growth, infestation by disease, or other conditions. The extent of subdivision desirable depends on a number of factors, including the type of pasture, the class of stock, the size of the herd or flock and others. In all cases where intensive or semi-intensive production of livestock or livestock products is aimed at (i.e., on dairying, fat lamb, and beef fattening properties), greater returns may be expected from subdividing the better-class portions of the holding than from cutting up the inferior areas into small paddocks. First attention, therefore, should be given to the most productive areas.

Care must be exercised in planning the layout of the paddocks in order to provide for the most convenient movement of the stock and their easy access to water. When subdividing paddocks it is generally unnecessary to erect the same type of fence as is used on the boundary lines. Something better than the usual type of temporary fence is, however, required. Only one type of pasture should be included in each paddock. If one area of poor pasture and another of better pasture occur in the one paddock the stock will neglect the inferior grass and concentrate upon the good pasture, to the detriment of the paddock as a whole. A similar distinction is shown in paddocks which have not been uniformly topdressed.

Rotational Grazing.

Since the object of securing a high measure of control of the grazing is to provide the short bite in a systematic manner, the pasture should not be allowed to grow rank, unpalatable and lacking in nutrition before being grazed. Usually a heavy concentration of stock for a few days on a paddock carrying young pasture, generally less than 12 inches tall, will clean the pasture up to the best advantage. When the pasture has been eaten down fairly closely the stock should be removed to another paddock and the eaten-down pasture permitted to develop a fresh growth before being again grazed. If a fresh young bite is to be available to the stock during most of the growing season of the pasture a fairly large number of paddocks will be necessary. Even on dairy farms in the districts most favoured by rainfall at least six paddocks should be provided.

The conception of grazing paddocks to a predetermined plan of rotation is generally inapplicable to Queensland conditions, but the purpose is served if each paddock is submitted to short and intermittent grazings rather than being grazed for long periods without interruption.

As a general rule, the young growth available in the small paddocks should be reserved for stock in production. If these do not graze the area evenly, dry and non-producing animals may be brought in to clean up the irregularities, or the mower may be used. Patches of long grass allowed to remain in the paddock will reduce the area of short, young pasture available during the next grazing period.

On well-subdivided farms, during the flush of the season, when it is difficult to keep the grass fed down, one or more of the paddocks could be shut up and the grass allowed to grow to the hay or silage stage when it might be mown for conservation.

Special care must be exercised in grazing pastures containing a high proportion of succulent legumes and clovers. Hungry ruminants ingesting a large quantity of succulent feed are apt to become "blown"; consequently, stock should be allowed on to legume-rich pastures for only fifteen to twenty minutes at a time, or they should not be put on until they are half full of grass or roughage.

Spreading Animal Droppings.

A paddock after being grazed has a scattering of droppings over its surface; but the extent to which the pasture can be benefited by distributing this manure before it becomes too hard is realised by too few farmers and graziers. The dung contains a fair proportion of the original food value of the grass and, if a dropping is allowed to lie undisturbed, the plant foods contained therein will lead to a rank growth of grass in that particular spot. This rank, patchy growth is not liked by stock, and if full advantage is to be taken of the manure available, the fertilizing ingredients must be more uniformly spread over the paddock. Distribution can be carried out by means of a special pasture harrow, or by running over the area an ordinary peg harrow

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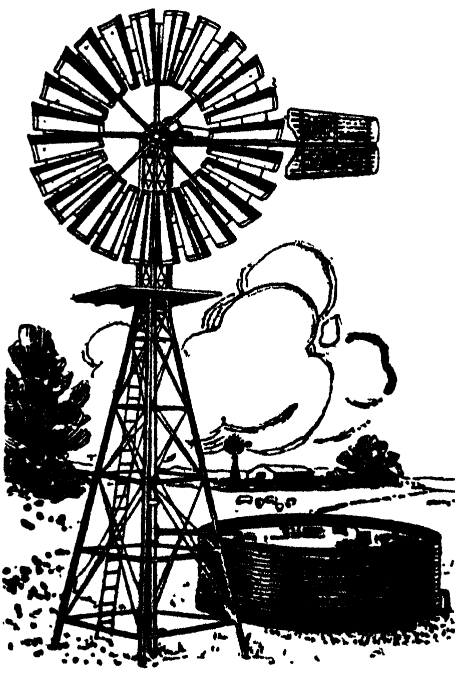

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about which several lengths of barbed wire are loosely coiled. A weatherboard or other type of timber drag is quite satisfactory, but its use on wet dung in dry weather should be avoided in order to prevent the fouling of the pasture by extensive smearing.

Mechanical Treatment of Pastures.

In many countries the mechanical treatment of certain types of pastures has long been a feature of efficient pasture management. In Queensland the value of the practice in renovating paspalum pastures has been demonstrated, but so far little has been discovered in regard to its effects on other pasture types.

In the sod type of grass pasture, conditions unfavourable to maximum pasture growth commence to develop once the sward is well established. The complete covering given to the soil by the pasture in many instances acts as a thatch which diverts rain water from the surface and prevents its penetration into the soil. This effect is pronounced where storm rains, and not steady, soaking falls, are experienced. In neglected pastures (perhaps partly as a result of droughty conditions caused by poor moisture penetration) old and dead roots accumulate in the upper layer of the soil and interfere with the development of young roots and with the aeration of the soil. A reduction in the productivity of the pasture is the general result of the conditions described, and their amelioration is largely a matter of breaking up the matted grass and the few inches of soil at the top.

The implements used for this purpose are varied and include the plough, the rotary hoe, special tine cultivators, &c. Further details are given under the sections dealing with the individual pasture plants.

Lime and Fertilizer Treatments.

The establishment and the maintenance of productive pastures depend to a large extent upon the degree of soil acidity and the amounts of available plant foods in the soil. Different pasture plants have different requirements in regard to both soil acidity and soil nutrients, but most sown pastures may be improved by attention to one or the other of these factors or both.

The degree of soil acidity may conveniently be expressed numerically by what is known as the pH value. A soil neither acid nor alkaline in nature has a pH value of 7; values from 7 down to 0 constitute the acid range; whereas values from 7 to 14 comprise the alkaline range. Most soils have pH values between 4 and 8. Soils of pH 0 to 4·7 may be regarded as very strongly acid; soils of pH 4·7 to 5·2 as strongly acid; those of pH 5·2 to 5·8 as of medium acidity, of pH 5·8 to 6·4 as moderately acid, and of pH 6·4 to 7·0 as slightly acid. Slightly alkaline soils range from 7·0 to 7·5, soils of medium alkalinity from pH 7·5 to 8·2, and strongly alkaline soils greater than pH 8·2. According to the National Fertilizer Association of the U.S.A. the most suitable pH ranges for various pasture plants are as follows:—lucerne, 6·5 to 7·5; red clover, 6·0 to 7·0; white clover, 6·0 to 7·0; barley, 5·5 to 7·0; wheat, 5·5 to 7·0; cowpeas, 5·5 to 7·0; grasses, 5·5 to 7·0; lespedeza, 5·5 to 7·0; oats, 5·5 to 7·0; velvet bean, 5·5 to 6·5; and vetch, 5·5 to 6·5.

In a general way, soil acidity is related to rainfall conditions, the wet coastal areas having more acid soils than the drier inland areas.

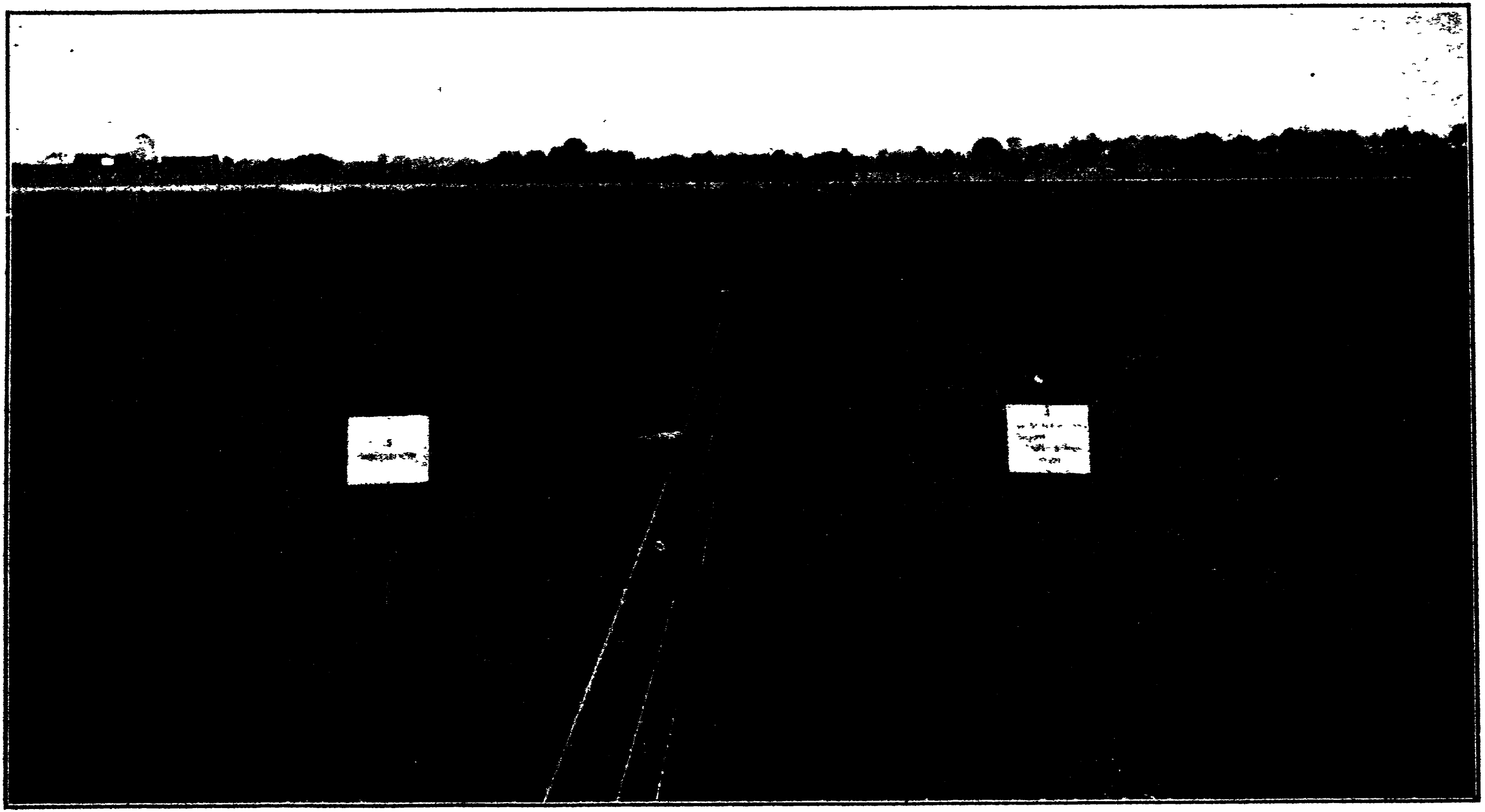

Plate 43.

ADJACENT PASPALUM PADDOCKS ON AN EAST MORETON DAIRY FARM.—The clover-rich paddock on the right was treated with a mixed fertilizer; that on the left was not fertilized.

In the wet Babinda area cane soils of pH 3·8 to 5·4 are common; some of the Atherton Tableland pasture soils have a pH as low as 5·2; black soils in the Callide, Lockyer and other river valleys are alkaline in nature, as are the pasture soils of the west. The poor development of legumes in the coastal cultivated pastures may be bound up with acid soil conditions; certainly the reduction of acidity by applications of lime has increased the clover content in many instances. Where the soil is shown by an acidity test to be strongly acid, the effects of the applications of lime should be tried. The amount of lime which must be added to a soil to reduce its acidity by one or more units of pH depends upon the soil type and, until our experience has been increased, the amount of lime to be added can only be roughly gauged. Lime for agricultural purposes is on the market in a number of forms of widely varying agricultural value, and those interested in the subject should procure a copy of a pamphlet entitled "Lime for Agricultural Purposes" from the Department of Agriculture and Stock before purchasing their requirements.

Whilst a certain amount of experimental work in connection with the top-dressing of Queensland pastures has been carried out, the exact place of fertilizers in pasture management and improvement is by no means clear. In some districts the problem is complicated by the effect of soil acidity and other soil characteristics on the availability of applied fertilizers and much investigational work is required in these areas. One of the chief effects of certain fertilizers on temperate pastures—viz., the encouragement of clovers and other legumes—is nullified to some extent in many Queensland areas because of the general unsuitability of climatic conditions to the growth of useful pasture legumes. A third disturbing factor is the uncertainty of the rainfall, and a fourth lies in the poor condition of matted pastures for the reception of added fertilizers.

In spite of the difficulties mentioned, a certain amount of pasture is successfully treated with fertilizers (plate 41) and it is fairly obvious that the practice must eventually become a regular feature of pasture management, at least in certain areas. The plant foods usually employed in fertilizers for stimulating pasture production are phosphate and nitrogen. The special effects of phosphatic fertilizers on pastures are the encouragement of root development in the seedlings and of legume growth. Nitrogenous fertilizers are especially valuable in promoting the leaf growth of grasses. Both kinds of materials increase palatability, feeding value and general productivity of pastures.

There are several methods of applying lime and fertilizers to pasture land. Hand-broadcasting from a bucket or bag is very tedious work and, on a windy day, unpleasant, but where small areas are being top-dressed it is the method commonly employed. An alternative means of top-dressing small areas is to employ a knapsack fertilizer broadcaster, of which several makes are available. For top-dressing large areas, specially designed machines are on the market. These are of two general types, namely, spreaders, and broadcasters.

The general form of broadcaster is a hopper fitted with a distributor disc designed to be driven from the wheel of the cart or lorry on which the hopper is intended to be mounted. (This type of broadcaster can also be obtained mounted on its own chassis.) The fertilizer is thrown to both sides of the machine by the revolving distributor disc. Even distribution and regular cover are somewhat difficult to obtain because of the influence of wind on the cast and the difficulty of driving to the line of the throw of the previous round. On rough country, however, these machines are very useful.

The fertilizer spreader is a self-contained machine. The fertilizer is released from the box by the movements of a "star" feed, or of an endless chain, and drops directly to the ground. An alternative machine to the special spreader is the ordinary wheat drill, but the draught of the latter is considerable when compared with that of the light spreader.

Where both lime and superphosphate are to be applied to a pasture, the application of the former should precede that of the superphosphate by as long a period as is possible. If the two substances are applied simultaneously the lime may cause portion of the superphosphate to revert from the useful water-soluble form to the less readily available citric acid soluble form.

Burning of Pastures.

The burning of paspalum, Rhodes grass and other cultivated pastures with the objects of getting rid of accumulated trash and coarse, dry material, and of encouraging the production of an early "bite" in the spring, is quite common in Queensland. Insufficient information is available to indicate precisely what is the effect of burning on such pastures, but there is no doubt that firing results in the destruction of a large amount of organic matter and probably has other harmful effects if regularly carried out. There is much to be said in favour of the view that the benefits obtainable from burning could be secured with fewer harmful effects by the adoption of a system of pasture management involving intermittent heavy grazing, the use of the mower, and the harrowing of the pastures.

Miscellaneous Aspects of Pasture Management.

Suitable shade should be provided for the stock in hot weather and shelters for their protection during cold weather. The location of these resting places should be chosen with a thought to the conservation of the animals' excreta. If the paddock slopes to a stream the animals should be encouraged to rest near the top of the slope, since, if they camp along the watercourses, heavy rains will wash the droppings away and remove a large amount of fertilizing material which otherwise could be retained on the pasture areas.

The several classes of livestock have different grazing habits and a proper appreciation of these habits will enable a much better utilisation of the pasture resources on a property to be achieved. Cattle are perhaps the most efficient grazers, inasmuch as they graze more uniformly than other classes of livestock. Sheep are more selective in their grazing, paying the greatest attention to the finer constituents of the pasture and neglecting the coarser plants. Horse paddocks usually deteriorate much more rapidly than other pastures, the horses allowing the coarser grasses to increase by neglecting them in favour of the fine grasses, which are eventually eaten out altogether. Sheep and goats eat some weeds and shrubs more readily than larger stock, and so are useful on dairy farms for cleaning up weedy pastures.

For most types of pasture it is found that most efficient grazing is attained by carrying two or three classes of livestock, but this is not always practicable. Pastures in parts of the Maranoa and Darling Downs, many of which are used for sheep-raising, require after an exceptionally favourable period of rainfall to be eaten off by cattle before the sheep can make good use of them.

[TO BE CONTINUED.]

PIGMENTS IN MILK.

Milk contains two kinds of colouring substances, one of which is soluble in water, and the other soluble in butterfat. The water soluble pigment is called lactochrome and its greenish-yellow colour may always be seen in whey during cheese manufacture. The pigment soluble in fat is yellow in colour, and is more interesting and important on account of its presence in butter. It is called carotin, and belongs to a group of colouring substances called carotinoids, which are widely distributed in plants and are also found in many animals. Carotin for example is also responsible for the yellowish colour of the fatty tissue and skin secretion of dairy cattle, especially Jerseys and Guernseys. Another carotinoid, which is very closely related to carotin and which is called lycopin, causes the red colour of tomatoes, watermelons, and other fruits, but has not been found to occur in animals or milk.

Carotin is found in all green plants, being manufactured by the plants themselves, but it is not manufactured in the body of animals. The presence of carotin in milk fat is therefore due to a direct transfer of this colouring substance from the food eaten by the cow.

This has been proved quite definitely by feeding experiments, which have shown that the amount of carotin in the fat increases or decreases, according to the amount of carotin present in the food. When cows are fed on such foods as cottonseed meal, timothy hay, white corn and yellow corn, the amount of carotin found in milk fat is very low compared with that obtained from cows fed on green lucerne hay, green crops, fresh pasture grass, and similar foods.

This offers an explanation of the seasonal variation in the natural colour of butter, and also indicates why butter from some districts is more yellow than butter from other districts. In those areas with a good annual rainfall and consequently a plentiful supply of green pasture, the colour of butter is always brighter than that produced in the drier parts of the State.

The various breeds of dairy cattle differ with respect to the amount of this yellow colouring substance in butter fat. Guernseys and Jerseys rank first in this respect, with Ayrshires, Shorthorns and Friesians lower down on the scale. Another interesting feature about this pigment is that, of all the animals whose milk is commonly used for human food, cows alone give milk which has a pronounced yellow colouration of the fat. Milk fat from the goat, ewe, camel, and water buffalo is almost entirely devoid of yellow colouring matter. The fat of human milk, however, is at times distinctly tinted by carotinoids. The reasons why such differences occur is not known.

A point of great interest and importance also is the relationship between carotin and vitamins in milk and butter. It has been shown that carotin can be transformed into vitamin A by the cow itself. The yellow colour of butter such as is often seen in spring and summer time, is therefore suggestive of richness in vitamins, and vitamin content is one of the best arguments for butter as a fatty food for children and adults.

O. St. J. Kent.

Sheep Grazing at the Mackay Experiment Station.*

D. L. McBRYDE.

THE necessity for diverting cane lands from the production of "excess" sugar into more profitable channels has been considered carefully by the Bureau, and canegrowers will probably be interested in the experiment which was undertaken at the Mackay Sugar Experiment Station, Te Kowai, during the spring of 1936. It marks an attempt to determine the value of the Mackay lands for pasture production, in a project which aims at breeding suitable types of cross-bred lambs, and fattening them for the market. The Minister for Agriculture and Stock (Hon. F. W. Bulcock) was closely associated with the initiation of the plan, and we are indebted to the Minister for his sustained interest and assistance in the work.

A block of 16 acres, situated on the poorest and wettest portion of the experiment station, was selected for the purpose, so that the tests are being conducted under rigorous conditions. The block has been subdivided into 8 sections, each 2 acres in area. When the rotation has been established, one section will be under plant cane, one under first ratoons, and the balance in grass, or in process of preparation for pasture or cane. The eight plots will thus have produced two crops of cane in the eight years of the rotation. The object of the trial is thus twofold—firstly, to produce cane, and, secondly, to devote the land to some profitable form of grazing while its fertility is being built up under pasture. The latter phase will be assisted still further by the judicious sowing and ploughing under, or feeding off, of leguminous crops.

At the present time four sections (about 8 acres) are fenced off as a grazing area. Here grasses are very well established—mainly *Panicum muticum* and Guinea grass. Portion of the present grazing area carries a rank growth of these species, while the balance was cut or burned off during 1936. The standover grass is too heavy and thick to permit the sheep to travel through it, and it will be burned off as soon as conditions will permit. Even the new growth grew so rapidly that the sheep were forced to keep to the tracks which they had beaten through it. This has since been mown to improve conditions.

The area is very wet and attention is being paid to the improvement of drainage conditions. Twice in recent months the entire paddock has been inundated by flood waters. On the first occasion twelve inches of water stood on the block for about twelve hours, while again in March there were several inches of water in all parts of the paddock for three days. This second flooding came at the conclusion of a wet period of about two weeks, during which the coats of the sheep were continuously saturated by the showery conditions.

Twenty-five ewes, 2-, 4-, and 6-tooths, were chosen from the flock of Mr. J. Jones, North Eton, for the purpose of the experiment. These animals are Merino-Corriedales, which were bred and reared on the Eton property. The ram is a stud animal, of the Romney Marsh breed, which was despatched from Southern Queensland to run with the ewes.

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* In *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

Plate 44.

Flock of Merino-Corriedale ewes at Mackay Experiment Station.

Despite the trying conditions which the sheep have passed through, recent inspection by Veterinary Officer Irving, of Rockhampton, proved that there was no sign of foot-rot, worms, or fly-blowing in the mob, and that all the animals were in excellent condition and quite normal in all respects.

The accompanying photographs were taken early in April, 1937.

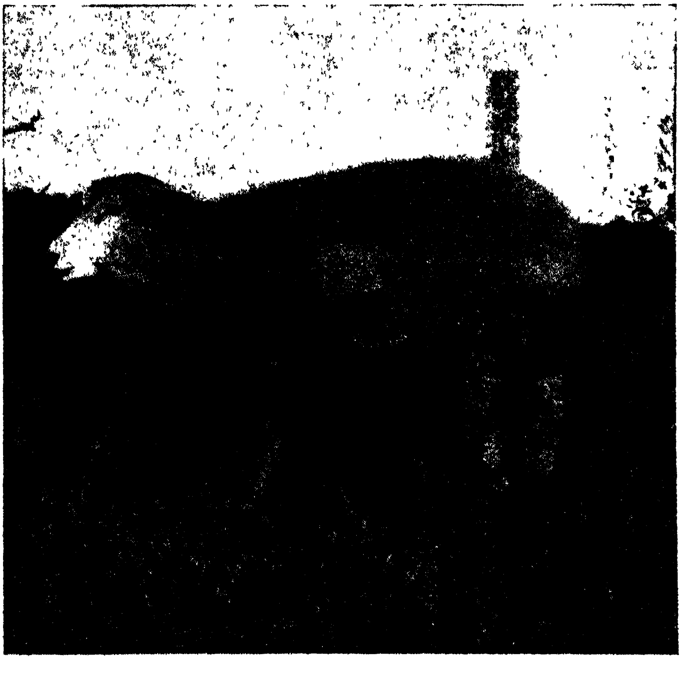

Plate 45.

Romney Marsh ram at the Mackay Experiment Station.

Common Milk and Cream Taints.

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory.

THE causes of undesirable or "off" flavours in milk and cream may be broadly grouped into—

A. Bacterial taints,
B. Those due to physiological disturbance,
C. Feed flavours,
D. Those due to traces of metals,
E. Absorbed flavours,

although it does not follow that one fault is always due to the same cause. Bitterness, for instance, may be either physiological, bacterial, or a feed taint.

Unclean or "Cowy" Odours.

Bacteria common in the cow-shed, present in manure, and carried about on dried dust particles in the atmosphere, on the cows' coats, and by milk utensils, are responsible for the unpleasant smell and taste variously described as "farmyard," "cowy," or "unclean," which is followed by souring with gassiness. These are not found in carefully produced milk and cream where conditions are hygenic.

Soapy Flavour.

Overneutralising of cream (or milk) may result in soapiness, which is actually a combination of part of the fat present with the alkaline neutraliser. In rare cases it is caused by an ammonia-forming group of bacteria, and it may show up in cooled milk when the normal souring group is not active.

Bitter Flavour.

There are several causes of bitterness developing in milk and cream. It may be due to a type of yeast, or to bacteria, usually of the spore-forming type, capable of breaking down the protein into bitter-tasting substances—this often occurs in pasteurised milk and cream where the normal acid-forming types have been destroyed.

Certain feeds, notably thistles, lupins, and vetches, if fed shortly before milking, have been found to produce a bitter taint in milk, the essential oils passing through from the blood stream unchanged. If it is possible to prevent the cow from consuming these feeds within three to four hours of milking, these substances have time to be dealt with by the body and are not secreted in the milk.

Mastitis Milk.

Both bitter and salty tastes result from the udder inflammation known as mastitis, mammitis, or garget. In the early stages, mastitis milk may be difficult to detect and separate from the rest, unless the first-drawn milk is carefully examined, when minute clots may be detected. Cream separated from mastitis milk has a flat, disagreeable flavour, due to the absence of normal acid-formation. Mastitis milk is unsuitable for cheese-making or for consumption, though it may be possible, if the infection is only slight, to pasteurise and use it for stock-feeding.

Late Lactation Milk.

Saltiness is also met with in milk from cows well advanced in lactation. The salt content of milk is a very variable quantity and reacts to any physical abnormality. Towards the end of the lactation period a large proportion of the potassium and phosphates are being used up in nourishing the young calf and are not secreted in the milk, so that the sodium chloride is proportionally greater. A rise in the chlorine content, which often accompanies advanced lactation, and an alteration in the chemical composition of the fat which sometimes occurs—giving an impression of rancidity—contribute to the unpleasant, salty, bitter, or rancid flavours frequently found in such milk.

Colostrum Milk.

The milk of newly-calved cows, known as colostrum, differs completely in colour, flavour, and composition from that obtained a week after calving. It is a viscous substance, with a sickly taste, and unfit for any dairy uses, while the cream separated from it is unsuitable for buttermaking—the fat is not identical with milk fat, and its taste is disagreeable. A comparison of the approximate composition of colostrum with that of milk shows its essential difference.

	Colostrum. Per cent.	Milk after 7 days. Per cent.
Fat	3·4	3·9
Sugar	2·5	5·1
Casein	4·8	2·5
Albumen Globulin	15·8	·7
Ash	1·8	·7
Water	71·7	87·1

The large proportion of albumen and globulin causes coagulation to take place on heating colostrum. Seven days should be allowed before the milk is used for any purpose other than calf-feeding—the substances contained in colostrum being specially adapted for the needs of the new-born calf.

The practice of including colostrum milk or cream with the bulk supply results in a loss of quality and a grading down of the whole delivery.

Disinfectant Flavour.

The use of strong chemicals for disinfecting purposes in the milking shed or dairy often results in a tainting of the milk and cream. Carbolic compounds should always be avoided. Potassium permanganate and lime may be used safely in the cow-shed. For other dairy purposes—such as water treatment, and disinfecting tanks—chlorine compounds are effective in action. Care should be taken, however, to make certain that the strength of the disinfectant solution is correct—chlorine has enormous germicidal power (·5 parts per million of free chlorine is efficient in sterilizing water) and it is often used in far too great a concentration, when, besides being uneconomical, it is liable to produce a serious off-flavour.

Oily, Tallowy, or Sunlight Taint.

Certain metals, notably copper and iron, when absorbed by milk and cream, are the cause of chemical changes in the fat which give a taste described as "oily," "tallowy," or "cardboard." This taint develops rapidly in the presence of air and direct sunlight, and cannot be removed. Often, a cooler or pipe from which the tinning has worn off, exposing a copper surface, will taint large amounts of milk, the taint developing after a longer or shorter time, according to conditions. In the same way, cream placed in rusty cans will take up considerable quantities of iron. In the warm state, milk and cream absorb metals more quickly, so that the retinning of worn utensils, especially cream cans which have become rusty, and coolers, should be done regularly. This is not a bacterial taint, and will develop in well-cooled and cold-stored milk and cream.

Other Absorbed Flavours.

Kerosene, petrol, smoke, engine exhaust fumes, paint, tar, and other strong-smelling substances produce taints in milk and cream, which readily absorb the odours from their immediate surroundings. Similarly, in the home, the flavour of other foods stored near milk, cream, or butter, such as fruit, onions, fish, &c., will be taken up by the milk fat in a very short time. Dairy products should, therefore, be stored well away from substances likely to impart a foreign flavour to them.

Control of Taints.

The control of most of these taints lies with the farmer, and on the care that he gives to his work depends the good quality of the finished dairy product. Bacterial off-flavours are only prevented by careful production methods and attention to cleanliness at all stages, and nothing can take the place of thorough washing, followed up by sterilization of all the equipment used.

It is important to remember that when once taints have become established in milk or cream on the farm, no subsequent treatment by the factory can be effective in removing them completely.

PREVENTION OF DISEASE IN PIGS.

By the general practice of hygiene and sanitation in the piggery, coupled with sound feeding methods, the incidence of most pig diseases can be considerably reduced.

The provision of roomy, well ventilated, but draught-proof sties is essential.

The floors should be swept clean every morning, all refuse being taken away and the yards raked over. Correct drainage of sties and yards will avoid the accumulation of water and help to keep down insanitary conditions.

Moisture is necessary for the free living stages of nearly all worm parasites and in its absence very few of them can survive for any length of time. Therefore, pig keepers who wish to avoid losses from worms must have dry, well-drained sties and yards.

Unhygienic and insanitary conditions are predisposing causes of rheumatism, catarrh, and some of the more serious bacterial infections, such as suppurative otitis and pneumonia. Piggeries should therefore be constructed on high ground: floors should be made of concrete and the run should be well sheltered from inclement weather.

Proper feeding is also essential for the maintenance of health in pigs. The food should be wholesome and must be supplied at regular intervals in proper quantities. Regularity in feeding induces better digestion. If the animals are properly fed, there is little likelihood of any food being left over. Stomach and bowel troubles, resulting from the ingestion of soured and fermented foods, are consequently minimised. Soiled food should be removed from the troughs and never mixed with fresh food.

Correct feeding and watering, together with adequate housing and paddocking, are undoubtedly most important factors in the preservation of the health of the pig.

—*E. R. Hollamby.*

The Role of Legumes in Rejuvenating Old Soils.*

H. W. KERR.

IN his speech delivered when opening the Cairns Conference of the Queensland Society of Sugar Cane Technologists, the Minister for Agriculture and Stock (Hon. F. W. Bulcock) made special reference to the need for developing some means of restoring lands on the tropical Queensland coastal plain to a higher plane of fertility without direct recourse to the costly method of applying artificial manures. The Minister alluded to the growing of some form of legume, or possibly mixed pasture with legumes, which would serve to build up the humus and nitrogen content of the land, while also providing a pasture of superior quality to that which customarily occupies such lands.

This recommendation should not be turned lightly aside: indeed the policy outlined is fundamental to any project of soil rejuvenation. It is well known to agriculturists that legumes possess the interesting property of enriching the nitrogen content of the soil in which they are grown and ploughed under, by virture of the co-operative effort which is accomplished between the host plant and the bacteria which live in the nodules to which they give rise, on the roots of their host. Legumes commonly employed for this specific purpose in the Queensland cane areas are Poona pea, black cowpea, and Mauritius bean; but there is a long series of leguminous species not so well-known to Queensland farmers but which find considerable favour in other States of the Commonwealth, and in countries overseas. As with other plant species, certain of these are better adapted than others for growth in any particular environment, and extensive experimentation is necessary to enable the most suitable legumes to be selected for a given set of conditions.

On the Queensland coastal lands which are devoted to cane production the particular conditions which are likely to be governing factors in this regard are (*a*) temperature, (*b*) soil acidity, and (*c*) general plant-food and soil moisture deficiencies. Vetches, for example, are generally restricted to the cooler regions, though they may prove successful as a winter crop in the tropics. Lucerne is generally regarded as a legume which likes a soil rich in lime, and with an absence of any marked degree of acidity; Poona pea, on the other hand, is not so sensitive to a moderate degree of soil acidity, though it does benefit of course from a dressing of lime applied to the soil before seeding. Poona pea will also withstand soil moisture deficiencies without undue distress, and yield satisfactory crops even where the general level of fertility of the soil is low.

In all probability there exist other leguminous species which could be tried to advantage under our conditions, and the Bureau has from time to time received supplies of seed of imported legumes for test purposes. A few years ago it was found for example that one of the "rattle-pod" family, known as *Crotolaria gorcensis*, was a specially prolific cropper under the dry conditions of Southern Queensland; but its propagation was not encouraged in cane areas due to the danger of its becoming a noxious weed. It produced seed very freely and our experience suggested that it would be objectionable for short fallowing. However, where a long fallow legume is desired, it offers distinct possibilities, though careful study of its grazing value would be necessary, as certain of the *Crotolaria* are poisonous to stock. This particular legume is receiving considerable attention from the pineapple industry, where it is an important factor in arresting soil erosion on hillside slopes. It is planted in the interspace between the rows of pines and cut when in full growth.

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* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

There is another important feature of legume culture which has been appreciated only in relatively recent years. Though the standard species employed in any area may be grown without difficulty, a new legume may be virtually a failure when first planted, whereas subsequent crops on the same land may be quite successful. An interesting example of this phenomenon is the early attempt to grow lucerne (or "alfalfa" as it is called) in the United States of America. When lucerne was first introduced to certain parts of the country, it was a rank failure, for no apparent cause. Careful study showed that this was due to the absence of nodules on the roots of the plants, suggesting that the particular organisms responsible for their development were absent from the land. Inoculation of the land with soil from a field in which lucerne could be grown successfully was found to overcome the difficulty, while similar results could be accomplished by employing a laboratory culture prepared with organisms which had been expressed from nodules, and sprinkled over the seed before planting. So highly beneficial has this treatment proved that it has now become a standard farming practice in that country.

It is found, therefore, that the existence in the soil of the organism capable of effecting nodulation with, for example, lucerne, does not ensure success with all other species. On the contrary it has been shown that legumes may be classified in distinct groups, such that one strain of the root-nodule organism will serve most effectively all members of that group, but it is less effective or even quite ineffective with members of other groups. There are many known strains of organisms within the "cowpea group" alone, while at least a dozen cross-inoculation groups of organisms are recognised. It then becomes the problem of the soil bacteriologist to assure himself that the particular strain of the organism is present before the agriculturist attempts to test the value of new legumes in any field. In order to make sure he must culture the desired strain and inoculate the seed with this culture before seeding the field.

So important is this problem that the pathological branch of the Bureau has recently embarked on a full study of the question in connection with the importation of the new legume species which are being tested in the Queensland cane areas. At the present time a wide range of strains are being cultured in the laboratory, and the value of inoculation is also being tested with plantings of even the standard legume species when they are planted for the first time in canelands which have grown only other types of legume. The object of the work is threefold—firstly, to determine the possibility of improving the growth of legumes now grown for green manurial purposes; secondly, to acquire, if possible, more suitable species for this purpose; and thirdly, to explore the possibility of propagating legumes which have also a commercial value, as a means of providing alternative crops for excess sugar cane.

At the present time the growth of lupins in the Southern areas, of lucerne in the central and far northern coastal district, and trial areas of Berseem clover, wild white clover, lespedeza, and several soybean varieties are also planned. Seeds of these species, together with their special bacterial cultures, have been collected from other states of the Commonwealth and from overseas. They will therefore be subjected to careful and thorough trial, and canegrowers should be interested in the outcome of these efforts.

Of particular interest is, perhaps, the soybean, as it has become a crop of high potentialities commercially in the United States of America in recent times. The soybean is indeed one of the oldest cultivated crops. It is described in ancient Chinese literature of nearly 5,000 years ago. and in its value and variety of uses it is still the outstanding legume grown in China and Japan. It is only during the last twenty-five years that the culture of the crop has assumed any importance outside Asia; by 1924, over 5 million bushels of grain were harvested annually in the United States, while in 1935, that country produced a yield of almost 40 million bushels of beans.

The soybean is grown as a summer leguminous annual. The pods are from 1 to 2½ inches long, and contain from 2 to 4 seeds. Stems, leaves and seed pods are covered with short reddish-brown or grey hairs. The root nodules are large and abundant. The stems are branched, and grow from 2 to 3½ feet or more in height. It is grown over a wide range of conditions, from the semi-tropical to the temperate regions. With the exception of cowpea and lespedeza, it is more acid tolerant than any other legume crop grown in the American corn belt, but it will, of course, respond well to soil treatment. The beans need a well-prepared seed bed, in order to give them a good start ahead of the weeds. The seed is harvested by the use of the combine, which threshes out the beans and leaves the straw on the land, to be turned under to enrich the soil. The average yield for 1935 in the State of Illinois was 18 bushels per acre.

The beans have a high feed value, their average composition being as follows:—

	%
Moisture	10
Protein	36
Fat	17
Carbohydrates, etc.	27

They thus differ markedly from other legumes which are usually very much lower in both protein and fat.

The oil which is expressed from the beans may be utilized in the preparation of edible fats, or soaps, while its "drying" properties render it of value in the paint and varnish industry. The meal which remains after the oil is expressed is a valuable concentrate which finds extensive use as a stockfeed.

One of the most recent industrial developments is the utilization of meal as raw material in the preparation of "plastics," which now find wide application in the manufacture of a variety of articles in everyday use. A waterproof-glue for plywoods may also be made from soybean meal, and this product is now in great demand where high tensile strength is demanded. Lastly, the meal is a valuable fertilizer material, due to its high nitrogen content.

These brief notes should indicate the possibilities of this interesting crop. Certain varieties have been grown in trial plots in the neighbourhood of Brisbane in recent years, and some attempt has been made to grow them in the cane areas. So far, the results of the latter trials have been disappointing, and it is our purpose to seek the cause of this failure. Possibly the researches now being undertaken by our pathology staff will indicate the difficulty. Reports show that the crop can be grown in the Philippine Islands, and it would therefore not appear to be due to our high tropical temperatures and humidity. Perhaps it is a question of discovering the correct variety for our particular conditions.

◆

PRUNING DECIDUOUS FRUIT TREES.

The pruning of deciduous fruit trees should be done as well as it is possible for the operator to do it.

To make a good job of pruning, good, clean, sharp tools are very necessary. Pruners will find it useful to provide themselves with a light box—fitted with a strap to make carrying easy—for holding secateurs, pruning saw, sharp pruning knife, oil-stone, oil-can, pot of coal tar, a brush and a bottle of disinfectant.

A good pair of secateurs is necessary, and they must be kept sharp and smooth. Every pruning cut causes a wound, but wounds of smaller diameter soon callus over provided the secateurs are sharp and clean. However, many pruners try to cut some of the larger limbs with their secateurs, and thus strain both the secateurs and their own wrists, while generally hacking the limb off and leaving rough edges which facilitate the entry of insect pests and fungous diseases. All large cuts should therefore be made with a saw, which, like the secateurs, should be both sharp and clean.

A sharp pruning knife is necessary for trimming the rough edges left by the saw, for, if they are not pared, callus formation is slow and the wound may not heal.

The need for an oil-stone and oil is obvious. A rub of the secateur blades on the oil-stone now and again keeps them keen and sharp, and makes the work much easier.

Pruners should always have with them a pot of coal tar, for tar is a disinfectant as well as a wood preservative, and, being pliable, makes a good surface covering. After pruning one tree and before going on the next, it is advantageous to paint all large cuts over with coal tar. The operation takes only a couple of minutes, and will help the tree considerably.

Both secateurs and saw often require disinfecting, for many diseases can be transferred from tree to tree by these implements. A strong solution of either formalin or corrosive sublimate rubbed over the blade with a rag will reduce any risk.

The foregoing suggestions are not trivial, as fruit trees on which a man depends for his living and which he expects to keep him for many years deserve the best treatment possible in regard to pruning as well as to cultivation and manuring.

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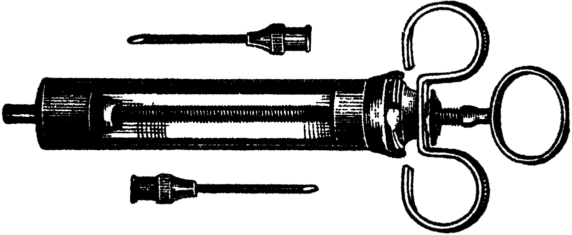

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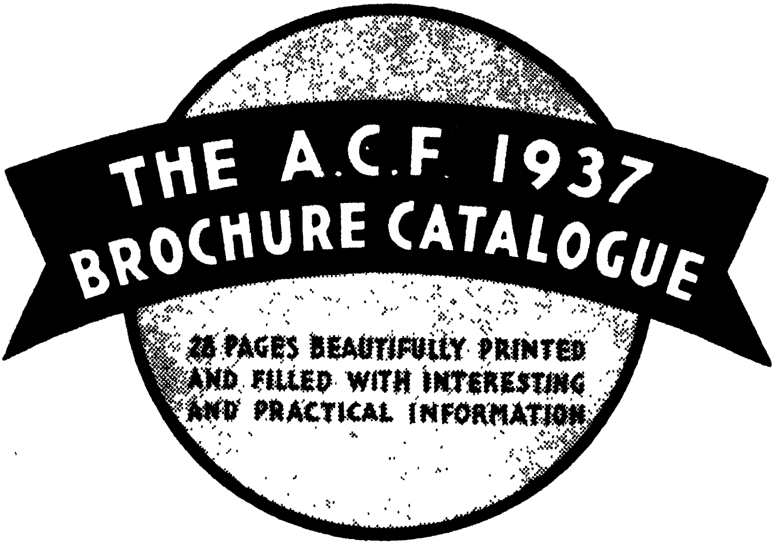
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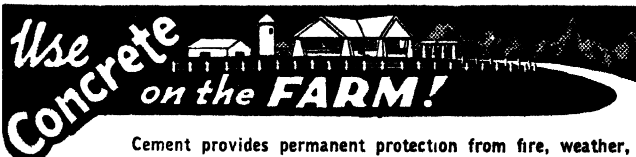
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An Attractive Pisé Dwelling.

A. E. GIBSON.*

THE merits of adobe or pisé structures, particularly where, for transport or other reasons, wood, brick, or concrete forms of construction are more or less impracticable, have been discussed previously in this Journal.†

Quite recently the construction of an attractive pisé dwelling and farm outbuildings at Woodridge by Mr. S. D. Galletly was under the notice of the Department of Agriculture and Stock.

Some two years ago Mr. Galletly conceived the idea of utilising pisé for the construction of a homestead and submitted samples of soil from his property to the Department for mechanical analysis. These tests proving satisfactory, he commenced building operations and gained valuable experience during their progress. To-day Mr. Galletly is the proud possessor of what is undoubtedly an attractive homestead, delightfully cool in summer and warm and cosy in the cold winter weather; and he has demonstrated successfully what can be done by an energetic man from materials close at hand.

The timber used in the building of the house was milled from hardwood timber grown on the property. Mr. Galletly has courteously supplied a ground plan of his house, together with a list of materials and details of the sizes of timber used; and these are submitted with the idea that they may be of guidance to those who are contemplating the erection of a house but to whom the idea of pisé construction has not previously occurred.

MATERIAL REQUIRED FOR COTTAGE AS DESIGNED.

Walls, 10 ft. high.

Main Building.

Doors and window frames.—22/10 ft.—8 in x 2 in.
Top plate.—100 lineal ft.—4 in. x 2 in.
Ceiling joists.—11/16 ft.—3 in. x 2 in.
Rafters.—21/9 ft.—3 in. x 2 in.
Purlins.—200 lineal ft.—3 in. x 1½ in.
Ridge pole.—34 lineal ft.—6 in. x 1 in.
Gable studs.—50 lineal ft.—3 in. x 2 in.
Ceiling.—800 super. feet.
Iron.—34 sheets—9 ft.
4 doors, 2 casements—6 ft. x 1 ft. 6 in.; 2—4 ft. x 3 ft.; 1—4 ft. x 4 ft.

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* Late Director of Agriculture.
† Q.A.J., Vol. xxxvi., July, 1931.

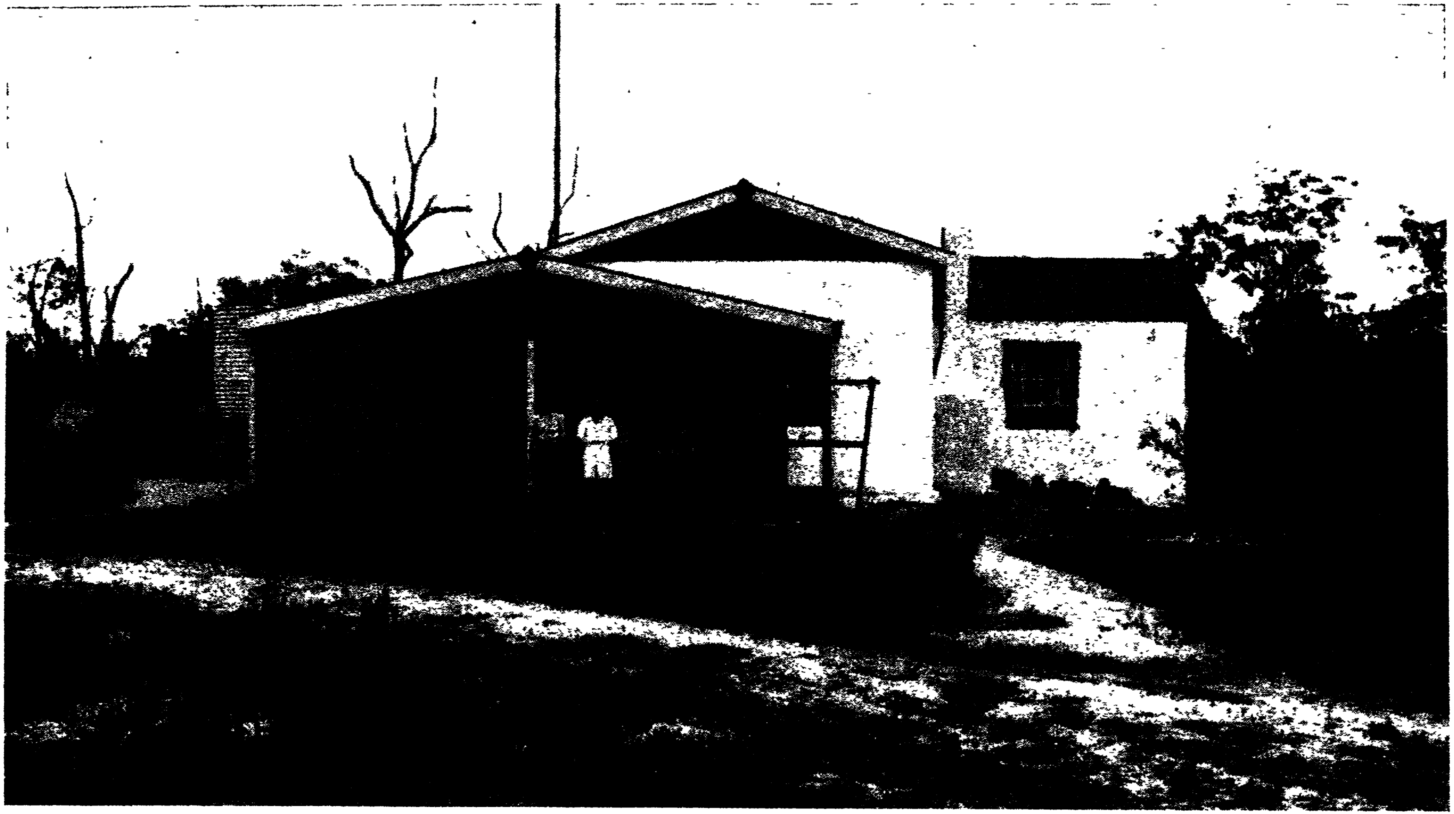

Plate 46.

AN EXAMPLE OF PISE CONSTRUCTION.—A farm homestead designed and built by Mr. Stewart Galletly.

Side Gable Room.

Ground plate.—3/12 ft.—4 in. x 3 in.
Floor joists.—5/12 ft.—4 in. x 2 in.
Flooring.—175 super. ft. hardwood.
Ceiling joists.—5/12 ft.—3 in. x 2 in.
Rafters.—10/8 ft.—3 in. x 2 in.
Purlins.—80 lineal ft.—3 in. x 1½ in.
Ridge pole.—1/20 ft.—6 in. x 1 in.
Weatherboards.—36 super. feet.
Ceiling.—8 sheets three-ply, 100 lineal ft. cover strips.
Iron.—30 sheets—9 ft.

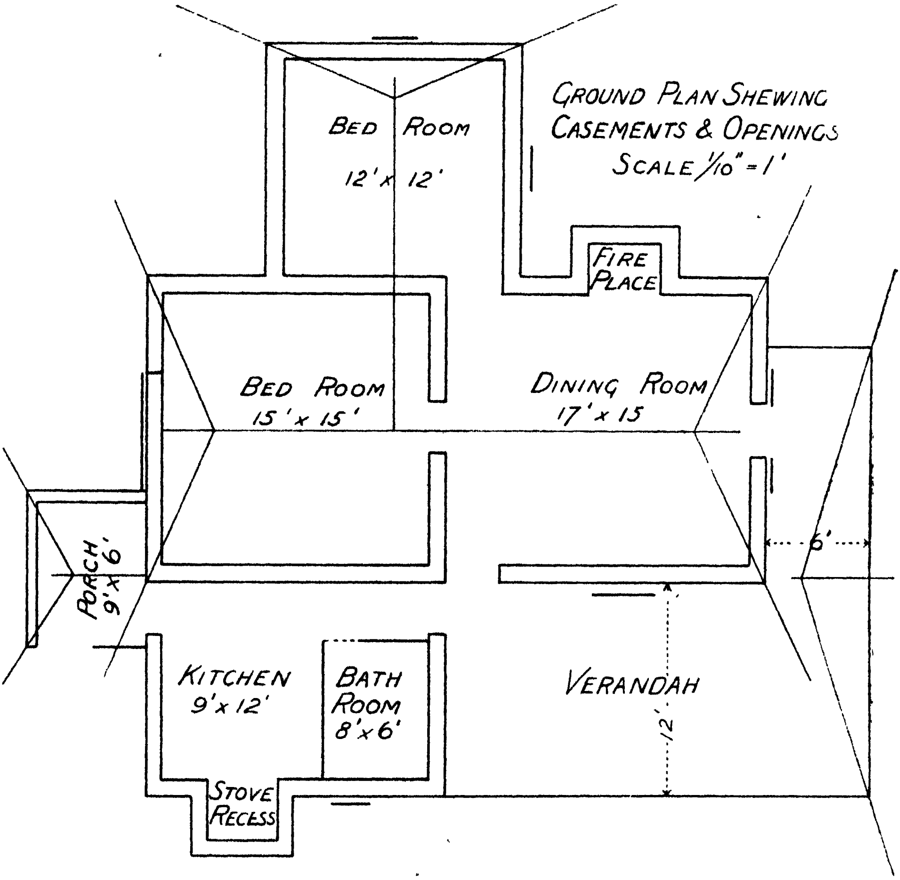

Plate 47.

Veranda, Kitchen, and Bathroom.

Ground plates.—3/24 ft., 3/6 ft.—4 in. x 3 in.
Floor joists—10/12 ft.—4 in. x 2 in.
Flooring.—400 super. ft. hardwood, shot edges.
Veranda posts.—6/8 ft.—4 in. x 4 in.
Veranda plate.—1/64 ft. lineal—6 in. x 2 in.
Rafters.—18/12 ft. 6 in.—3 in. x 2 in.

Plate 48.

Farm buildings of Pisé on Mr. Stewart Galletly's property near Woodridge.

Pole plate.—1/42 ft.—3 in. x 2 in.
Purlins.—250 lineal ft.—3 in. x 1½ in.
Gable studs.—25 lineal ft. -3 in. x 2 in.
Weatherboards.—75 super. ft.
Partition.—8 sheets three-ply.
3 doors, 2 windows.
Iron.—50 sheets—6 ft.
Flashing.—42 ft.

20 lengths of spouting.
10 lengths ridgecapping.
2 tons cement.
1 roll ruberoid.
Nails, paint, paper, &c., not shown.

CITRUS TREES AND THEIR FOOD REQUIREMENTS.

A citrus tree does not grow at a uniform rate, but makes three or more growths of shoots and leaves each year. The times when these growths occur, and the degree of their development, may vary with local conditions, the availability of plant foods and methods of tillage and irrigation.

In the spring, shortly before blossoming, the heaviest growth occurs, and from this stage, particularly until the approach of the wet season, the soil should be maintained in good cultural condition to enable the trees to obtain the essential plant foods by means of a healthy, vigorous root system. There is a smaller and irregular growth of twigs and leaves about midsummer, and a third growth in the autumn.

In the trunk and main branches dissolved mineral matter taken from the soil by the roots passes upwards to the leaves, and elaborated plant foods pass downwards from the leaves to the roots. Citrus trees in healthy condition do not shed their leaves before the new ones have become at least partially developed; therefore, the heaviest leaf fall usually takes place after the spring growth.

Careful tillage and drainage, although absolutely necessary for successful fruit growing, are not, however, sufficient to maintain the fertility of the land from year to year without the aid of organic manures or fertilizers. Growers from practical experience have learned the truth of this statement. Owing to the difficulty of procuring sufficient quantities of organic manure, mineral fertilizers are applied which supply nitrogen, phosphoric acid, and potash to the soil, each constituent being necessary for the production of good fruit and the maintenance of healthy trees.

Certain points relative to the effects that these constituents are likely to have on the development of the trees, and on the production of the orchard, are worth considering, in order that growers may be able to decide as to their own particular requirements.

The effects of a generous supply of nitrogen are much more apparent than those of either phosphoric acid or potash. Nitrogen stimulates vegetative growth and large applications of it will increase the amount of rag and the thickness of the rind of the fruit. Insufficient nitrogen, however, is indicated by yellowish-coloured leaves, and the trees generally have a stunted appearance.

Unless adequate phosphoric acid is available the fruit does not develop normally. Phosphatic manures promote root development, and heavy applications hasten the maturity of the fruit.

Large quantities of potash will cause the rind of the fruit to be much thinner, and have a marked influence in improving the keeping and carrying qualities of the fruit. Potash also increases the vigour of the tree, and intensifies its resistance to adverse conditions.

These facts show that these three plant foods must be judiciously balanced to meet the requirements of the trees.

—*H. Collard.*

Sunspots and Climate.

H. I. JENSEN, D.Sc.*

IN a scientific paper published in 1904, the writer drew attention to the correlation between sunspot minima and protracted droughts in Australia. Thus 1811, 1822, 1833, 1844-46, 1855, 1864-69, 1877, 1888-89, 1900 to 1902, 1912, 1923-24, and 1934-36 have been periods of drought, and the most disastrous of these were in the "Great minima" of 1833, 1864-67, 1900-1902, 1934-36.

It is noticeable that all the droughts of a protracted and widespread nature came in periods of sunspot minimum, approximately at an eleven years interval, and the worst in the periods of Brückner minima, at an approximately thirty-five years interval.

The idea of such a relationship existing between climate and sunspots was by no means new. Dr. Brückner and Dr. Julius Hann, notable German-Austrian meteorologists, had many years earlier noticed the same facts in regard to European climate.

Sir Norman Lockyer, the great British astronomer, was a protagonist of the close inter-relationship of sunspot and weather cycles, and Alexander McDowall, a Scottish scientist, had demonstrated that the time of the flowering of plants was affected by the sunspot cycle.

Jevons, the English economist, had many years earlier shown that the world's prices of wheat fluctuated with the sunspot cycle, and that Indian famines coincided with years of sunspot minima.

During the past forty years great droughts have commenced and ended earlier in the Northern hemisphere than in the Southern. The drought of 1900-1902 affected Argentine, Egypt, India, Europe, and Siberia, as well as Australia, but commenced and ended earlier in Europe than in Australia. The drought of 1922-23 in Russia and Siberia affected Australia in 1923-24, and the last great drought has been playing havoc in Europe and America for several years.

In spite of the fact that this periodicity or cyclical recurrence of great droughts is so well known, American and international wheat speculators do not ignore well-known and well-established facts about the connection between sunspots and wheat prices.

Our producers' organisations, on the other hand, apparently disregard these facts. Thus it is reported that almost the whole 47,000,000 bushels of the New South Wales 1935 wheat-crop were exported early in 1936 and a large portion of the 1936 crop was sold in advance at a loss of 1s. 6d. to 2s. per bushel on the world price for 1936. Thus the farmers of New South Wales lost at least £3,000,000 by not having an organisation capable of anticipating price fluctuations, and wheat speculators benefited to that extent. Millions of head of cattle and sheep have been lost through drought which could and should have been saved.

The present writer wrote several articles on this subject in 1922 and 1923. In one of these ("Daily Mail," Brisbane, 6th January, 1923) he remarked: "There seems to be little hope of science ever being able to achieve exact seasonal forecasts for small districts. The best that astronomy can yield is a general continental forecast, giving indication of the class of season to expect. This, however, should be of great aid to agriculturists and pastoralists.

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* Formerly Government Geologist, Northern Territory, and of the Department of Mines, Queensland.

"Owing to the mobility of the atmosphere, small causes often produced by the action of man, such as a bushfire, the clearing of virgin scrub, or similar occurrences, frequently cause an abnormal season for the environment." The position is still the same although, during the last few years, South African meteorologists have found that moderately correct forecasts for individual districts can be made, other things being equal, by studying past rainfall records in relation to sunspot minima and maxima.

There is a tendency for the same type of season to recur in the same district at the same approximate period from each maximum and minimum. If it could be proved that the same tendency held good for Australia it would be very helpful.

In the same article reference was made to experiments in rain-making, and the fact was emphasised that the necessary condition for rain-making artificially is that moisture-laden clouds must be present, and that up to the time of writing no rain-making experiments had been successful. In another article in the "Daily Mail" (December, 1926) the writer suggested the use of aeroplanes to shoot dust into the clouds for the purpose of forming condensation nuclei.

During the last couple of years this method has been successfully tried in Europe; but in all rain-making the first essential is favourable conditions, and they do not often exist in sunspot minima.

In another article in the "Western Star" (23rd March, 1928) the writer said: "We may expect good years from 1928 to 1932 and then a gradual desiccation culminating in a record drought from 1934 to 1937."

In various statements to the North Queensland press in 1934 the writer again gave a warning that the increasing frequency of earthquakes and volcanic eruptions in other parts of the world were a portent that a fresh drought was commencing, and he said that a serious drought was to be expected in 1935 and 1936.

It was pointed out in these articles that there was yet time to make provision for stock, and to perfect organisations for the marketing of produce both to protect the Australian farmers against exploitation at the hands of speculators, and the Australian pastoralists against excessive prices for feed for starving stock.

Unfortunately nature's warnings have been ignored, and few, if any, of Australia's stockowners have made any provision against drought in the past. It now avails little to discuss what might have been done; but it is to be hoped that professors of agriculture, scientists guiding the pastoral industry, and the great farmers' and pastoralists' organisations will set a little time aside between now and the next anticipated droughts (1946-47 and 1957-58) to go into ways and means of reducing drought losses to a minimum. It is also to be hoped that national policy will include the provision of substantial sums for the making of dams and irrigation channels, silo construction for the conservation of native fodder grasses, and similar undertakings.

Judging Pork and Bacon Carcases.

IN an article appearing in the "Pig Breeders' Annual" for 1936-37 details are disclosed of a standard method of valuing porker and baconer carcases supplied to the British market which, it is believed, will be welcomed heartily by men prominent in the pig industry in Australia. This method has been arrived at through the collaboration of Mr. H. R. Davidson, M.A. (Cantab.), Dip. Agric., late School of Agriculture, Cambridge, and Rowett Research Institute, Aberdeen; John Hammond, M.A., D.Sc., F.R.S., School of Agriculture, Cambridge University; and Jos. B. Swain and Nevill L. Wright, F.I.C., D.I.C., Scientific Liaison Officer, New Zealand Government.

In reviewing the article, Mr. L. A. Downey, H.D.A., Instructor in Pig Raising, says all will agree that the consumer is the judge who counts really in deciding the quality of pork and pork products, and it is necessary therefore to base any system of pig-judging on a knowledge of the consumer's requirements.

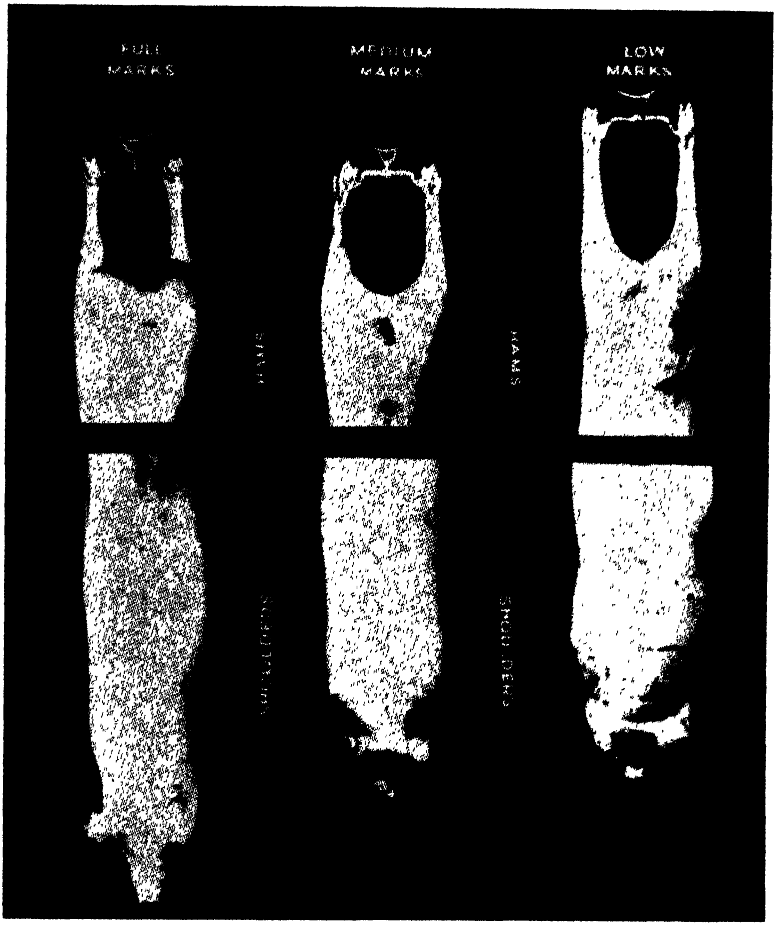
When judging breeding pigs, the good judge keeps well in mind trade and consumer requirements, and balances these features with constitution and breeding ability, characteristics which are of such importance to farmers.

In judging porkers and baconers alive, the judge endeavours to anticipate how the pigs will appear in carcase form and how closely their carcases will conform to his idea of trade requirements. In such a task he must do some guess-work. The judging of carcases is far more reliable than live pig judging, for one can see actually what lies under the coat when the pig is dressed and opened up. Even carcase-judging may not be altogether reliable, because, if the carcases are judged on appearance only, and compared with the ideal in the judge's mind, that factor of individual opinion, which is very variable, will play always a big part in the making of decisions.

British and Australian Standards.

The authors, says Mr. Downey, offer their method for the guidance of those supplying frozen porkers and baconers to the British market, for use in judging competitions, and for individual farmers to check up on the carcase quality of their pigs. Although prepared for pigs supplied to the British market, the standard for judging is found to agree very closely with the requirements of the Australian domestic trade.

JUDGING BY EYE APPRAISAL.
STANDARDS FOR AWARD OF MARKS.



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain.*

Plate 49.

Careful consideration has been given by the authors to consumers' requirements in arriving at the proportion of the total marks to be allotted for each feature of the carcase, and in determining the most desirable measurements for the various parts of carcases of given weight classifications. Such a sense of proportion is shown by the valuation of carcases that, when one has valued a carcase according to this method, he has a feeling of complete satisfaction that the results must be correct. Such a balance of values is very difficult to obtain by a mere visual inspection of the carcase as a whole, as has been practised previously in carcase competitions.

With the object of providing a standard system which can be used by almost anyone (not necessarily an expert) and which is not influenced by the personal opinion of the judge, the authors have, in their own words, "whenever possible, tried to obtain a *measurement* to express the point, rather than to rely on visual judgment, into which the personal element enters. As regards three points, however (hams, shoulders, and streaks), we have not yet been able to arrive at a satisfactory measurement. For the streak, several methods have been tried and discarded as imperfect. Further work on these points is required before judgment by measurement is applied. Therefore, for the judgment of hams, shoulders, and streaks by the visual method, we have constructed photographic standards covering the allotted range of marks, so that the personal element can be reduced to a minimum."

The Scale of Points.

The scale of points is divided under the headings of marketing points and breeders' points, the latter being subdivided into points by inspection and points by measurement.

The standard of marking suggested is very severe and only good carcases will obtain more than 50 per cent. of the total. There is room, however, for a really excellent carcase to get close to 100 per cent.

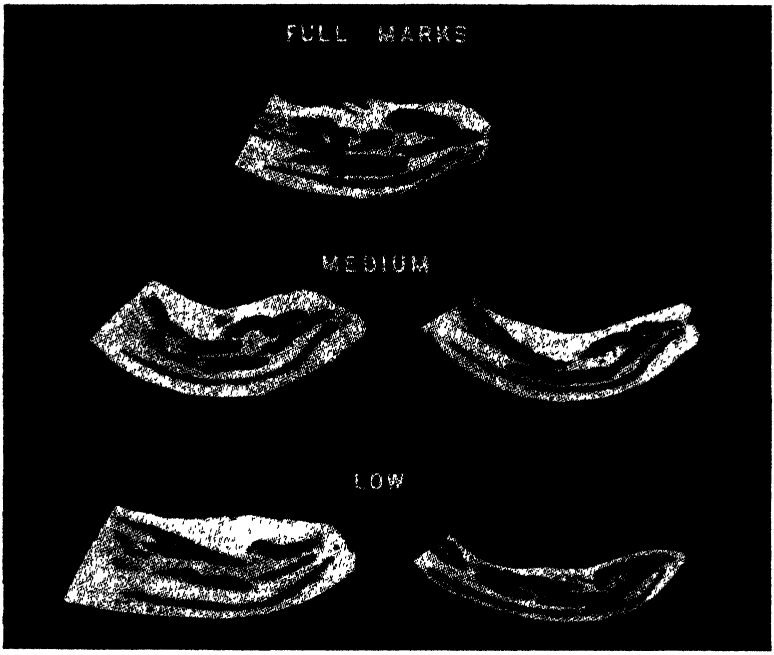
	Marks.	
	Porkers.	Baconers.
(1) Marketing points—		
Colour—clean, fresh, white	5	5
Skin—smooth and fine	5	
Dressing—freedom from bruises and hair	5	5
	15	10
(2) Breeders' points—		
(*a*) By inspection:		
Hams—well-filled and fine-boned	8	8
Shoulders—light	7	7
Streak—thick, full of lean meat	12	12
(*b*) By measurement:		
"Eye muscle" of loin, thick	28	28
Backfat thickness, correct proportion	20	20
Body length in proportion to weight	20	20
Leg length—short	5	5
	100	100
(3) Suitability of carcase weight		15
Total Marks	115	125

With regard to porkers, the article states: "The weights of carcases most in demand for the London trade are from 60 to 80 lb., although during the summer months, and in some other markets, there is some demand for heavier carcases for cutting purposes. The latter conveniently fall into two main groups—80 to 100 lb. and 100 to 120 lb. Since the main trend of future trade, in analogy with "Canterbury lamb,'' will probably be with the 60 to 80 lb. group, it is on this group that we have concentrated most. Scales, however, have been prepared for the other groups as well.''

With baconers, the standard adopted was a Class I. carcase for the Wiltshire bacon trade under the British grading specifications, and as a guide to overseas producers the authors suggest a carcase weight range of 135 to 154 lb. as being most desirable, and where a guide is wanted the 15 points are included in the scale of points.

STANDARDS FOR AWARD OF MARKS.
BY EYE APPRAISAL.

STREAK (BACONER).



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain.*

Plate 50.

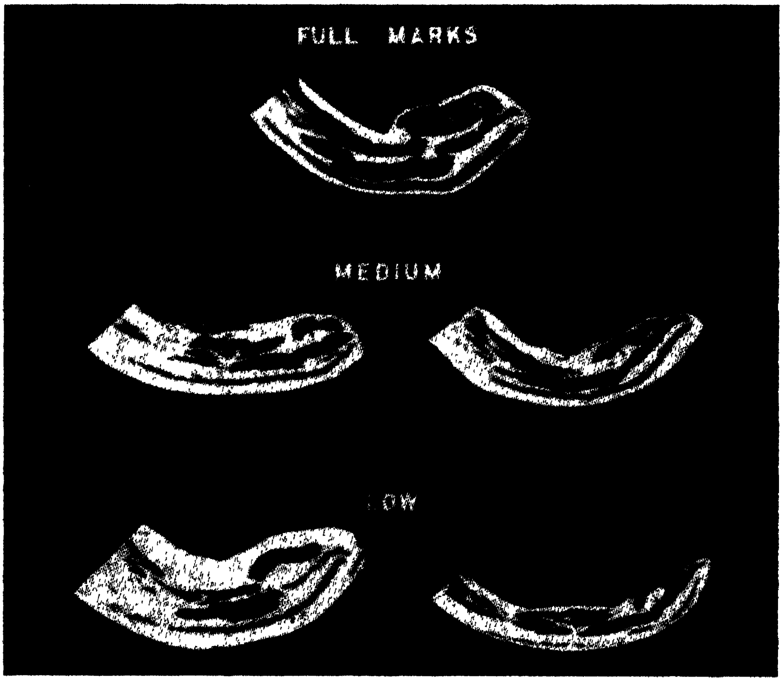
Method of Procedure.

Having ascertained the weights of carcases, the judge views them from behind and values each carcase on the marketing points as shown in the scale of points, and on the hams and shoulders, using as a standard the photographs as shown in plate 47 the suggested marking being the possible 8 points for the best hams, 4 points for the medium hams, and 1 point for the worst hams in the illustration, and, of course, varying points in between these according to the relative value of the hams. The shoulders are valued in comparison with the photographic standard, in which the best shoulders are valued at 7 points, the worst at 1 point, and the intermediate shoulders at 4 points: the judge then uses his discretion regarding shoulders falling between those illustrated.

The carcases are sawn down the centre line into two sides, and the length of body and length of leg are taken from the points shown in plate 48, using a tape measure graduated in millimetres. As the length of body and shortness of leg are valued in proportion to the carcase weight, tables have been prepared indicating the most desirable measurements for pigs of any particular weight range, and by reference to these tables, according to the weight of the carcase and its measurements, the judge can read off the number of points gained by each carcase for these features.

STANDARDS FOR AWARD OF MARKS.
BY EYE APPRAISAL.

STREAK (PORKER).



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain*

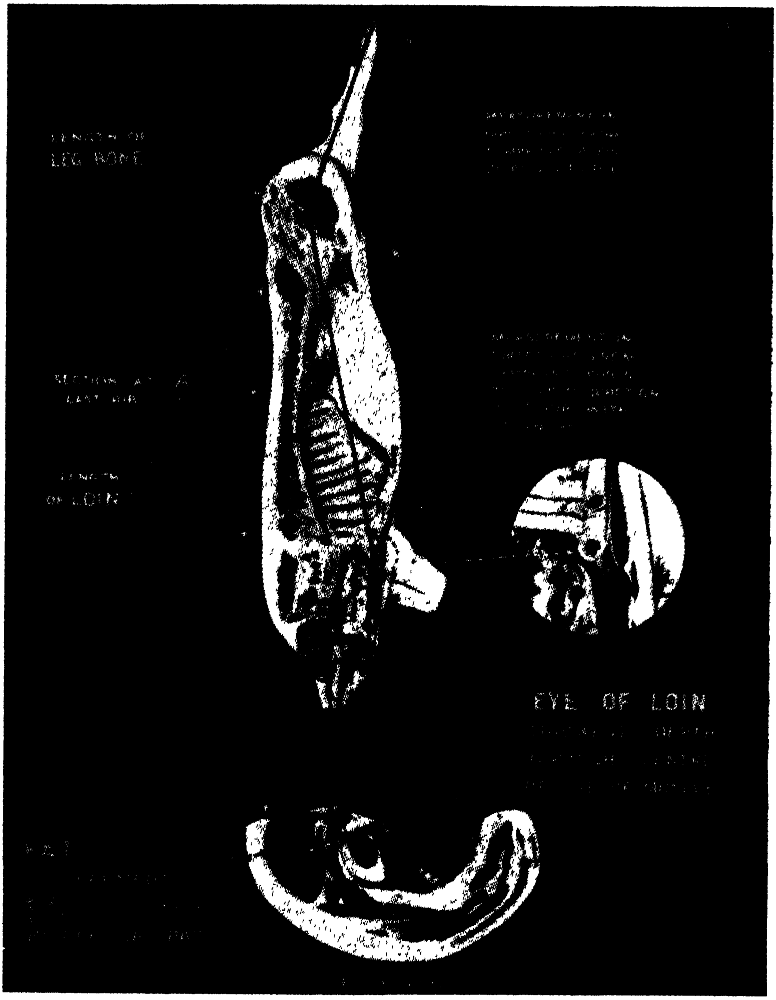
Plate 51.

One side of the carcase is then cut through level with the last rib, and from the cut surface of the hind part of the side, further valuations are made. The streak is compared with the photographic standard (see plates 49 and 50) and marked according to the standard—namely, 12 points for best, 1 point for the worst, and 6 points for the medium streaks, as illustrated. The streak should be thick and fleshy, and in porkers there should be a greater proportion of lean to fat than is required in baconers.

The eye muscle and back fat are then measured by callipers at the positions shown in plate 48, excepting that on porkers the backfat measurement is taken 1 inch from the middle line, whereas on baconers it is taken 1½ inches from the middle line. These measurements are then referred to tables provided, to give their respective value in accordance with the weight of the carcase.

The award sheet on a carcase gives the breeder a lead towards determining the cause of any defect in his pig carcases. For example, a badly shaped ham or shoulder is obviously a fault in the conformation of breeding stock, and a thin streak may be due to inherited faulty conformation or to giving the pigs too much bulky food or excessive liquid. An under-developed eye muscle is probably inherited to some extent, but it may also be due to faulty feeding, such as a deficiency of protein when the pig is in its early growth stage, about weaning time.

JUDGING BY AWARD OF MARKS FROM MEASUREMENT.



[*Produced for New Zealand Evaluation Committee by Jos. B Swain*

Plate 52.

Too little or too much backfat may be due to faulty feeding, but mostly it indicates that the pig had either not reached, or had passed, that stage of maturity at which it would have given a good carcase. A porker type pig slaughtered at bacon weight can usually be expected to give an over-fat carcase.

Length of body is certainly inherited, but it is possibly influenced by feeding and management to a limited extent. Pigs vary in the number of ribs they possess, and this materially affects their length of body. When a carcase is too long in the leg it is due either to inheritance or to having been slaughtered before it was sufficiently matured.

It will be gathered that the system of judging is most exacting, but it can be of immense value to the careful pig breeder who desires definite information on which to base his work.

Already some preliminary judging by these methods has been carried out in Queensland, and the carcases of the export bacon pigs at the 1937 Royal National Show held in Brisbane will be judged on the new scheme of marking.

PREPARATION OF LAND FOR MAIZE.

To get the best results maize requires a good soil, in which a plentiful supply of plant food is available, a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least nine inches during the winter and allowed to lie in the rough until the early spring. The action of the frost and the rain will improve the texture of the soil and will leave it in a mellow condition. In the early spring the land should receive a second ploughing, if possible, a cross ploughing. This should not be so deep as the first ploughing, and should be immediately followed by a harrowing and cross harrowing to work the surface soil into a fine tilth.

If a crop of weeds is turned under during the second ploughing, planting should not be carried out for at least a few weeks to allow decomposition to take place. On land which is not too heavy and moist, rolling is desirable, as it consolidates the soil and helps to make a good firm seedbed. Rolling should always be followed by a light harrowing.

Preparation of Seedbeds.—The preparation of the seedbed is one of the most important points in the production of maize and no amount of after cultivation will undo the damage caused by planting in a badly prepared piece of land.

One has only to see the difference, not only in the growth but in the colour of the foliage also, between a crop grown on thoroughly prepared and another on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a well-prepared seedbed—in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

Time to plant.—The best time to plant will naturally vary in different districts. In districts which have a long growing season and a comparatively regular rainfall, planting can be carried out whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district; and secondly, to try and have the crops tasselling during periods in which rain can usually be expected. Maize must have moist conditions during tasselling, and if hot, dry winds occur during this period, the pollen is shed too early and fertilization cannot take place.

Seed should be sown in drills spaced 3 ft. 6 in. to 4 ft. apart. The wider spacing is essential for the tall-growing, late-maturing varieties. As a general rule, single spacing in the rows gives the best results, the grains being dropped singly, with a distance of approximately 12 in. between the grains for the quick-maturing varieties, and from 15 to 18 in. for the late-maturing varieties.

From 9 lb. to 12 lb. of seed is sufficient to plant an acre when sown in this manner.

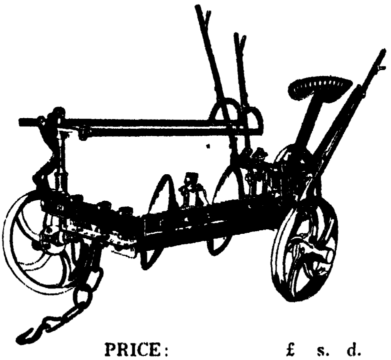
The seed drill is the most satisfactory implement for sowing maize, as it ensures a good even spacing, and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

C. J. McKeon.

FARMERS

Now is the time to prepare your land for planting Maize and Cotton. To get the best results it is necessary to have a good plough. The Sunshine line of Implements are built to suit Australian conditions, and the plough most suitable for the purpose is the **SUNNIE Light Set Disc Plough.**

It is light in draught, and substantially built of the best material. Can be adjusted to suit various conditions of soil, and will plough the hardest ground to give lasting satisfaction.



PRICE:	£	s.	d.
Single furrow	19	5	0
Double furrow	23	15	0
Three furrow	32	10	0

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TERMS: Half cash, balance 12 months, or less a discount of 2½ per cent. for all Cash on Delivery. Can also be supplied on 1/3 Cash, 1/3 12 and 24 months at a small extra cost.

For further particulars of this and all other lines of Farm Implements, see your Local Agent, or write—

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Whenever practicable, why not place your orders with them

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The acceptance of their advertisements by this Journal is a guarantee of excellent quality and high standard of goods and service

SUPPORT THE ADVERTISERS WHO SUPPORT YOUR OWN JOURNAL.

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KREOLA SHEEP DIP

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Weighing Pigs on the Farm.

W. H. BECHTEL, Instructor in Agriculture, and A. L. CLAY, B.V.Sc., Government Veterinary Surgeon.

ALL farmers engaged in the production of pigs, either as a main occupation or as a sideline, have doubtless felt the need for an easy, reliable, and economical method of weighing pigs.

It is advisable, if not essential, that pigs should be weighed at intervals during the growing stages, as it is by this means only that a correct knowledge of the relation between feeding and gains in live weight can be obtained. All pigs should be weighed immediately before being marketed, as in this way misunderstandings between the grower and the factory will be obviated.

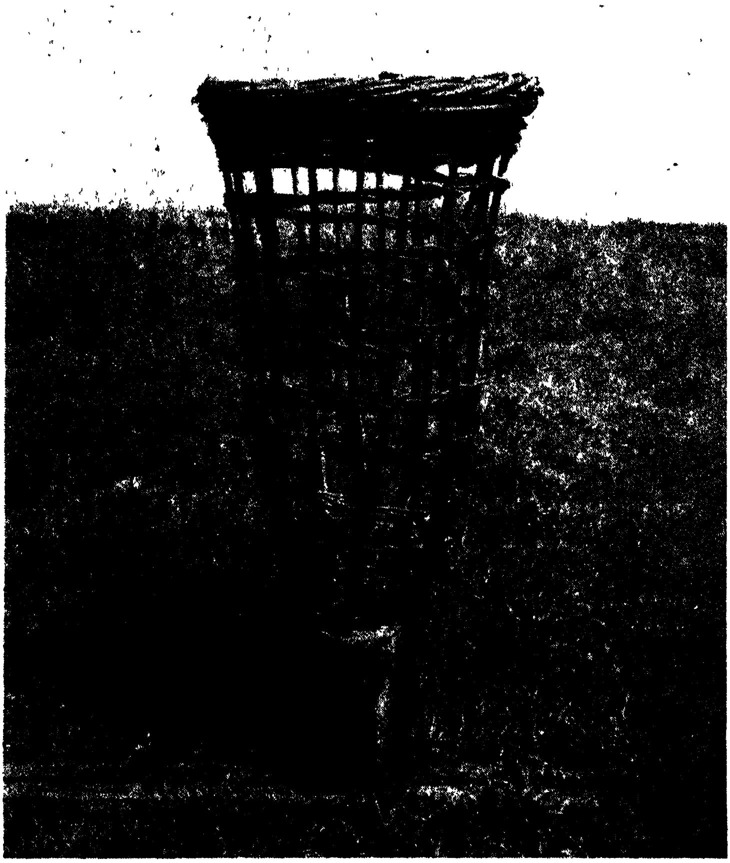


Plate 53.
Weighing Basket made with Lawyer Vine.

On the Atherton Tableland we have found that a combination consisting of a spring balance and basket (see illustrations) fulfils the required conditions as near to perfection as reasonably can be expected. The contrivance has the added advantage of being easily portable.

The basket is made of lawyer vine (which is obtainable locally), but imported basket canes would probably serve as well should lawyer vine be unprocurable. Briefly, it may be described as being of a woven open-mesh type, shaped like a blunt-nosed bullet, and standing 48 inches in height, with a diameter of 24 inches at the top and tapering off to 10 inches at the bottom. The vertical ribs are in one piece, being continuous around the bottom of the basket. They are ¾ inch to 1 inch in diameter, nine in number, and spaced 4 inches apart at the top, coming together to a folded-over interlaced cap at the bottom, and finally finished off into a woven top. The cross stays are of ⅜ inch diameter, being three-ply used in a twisted woven fashion in and out of the vertical ribs, commencing at the top with an 8-inch wide close section, then passing around the basket in a spiral fashion, beginning with a 4-inch spacing and gradually reducing to a 2-inch spacing at the bottom. These cross stays are held in position by looping a light cane from top to bottom along each rib.

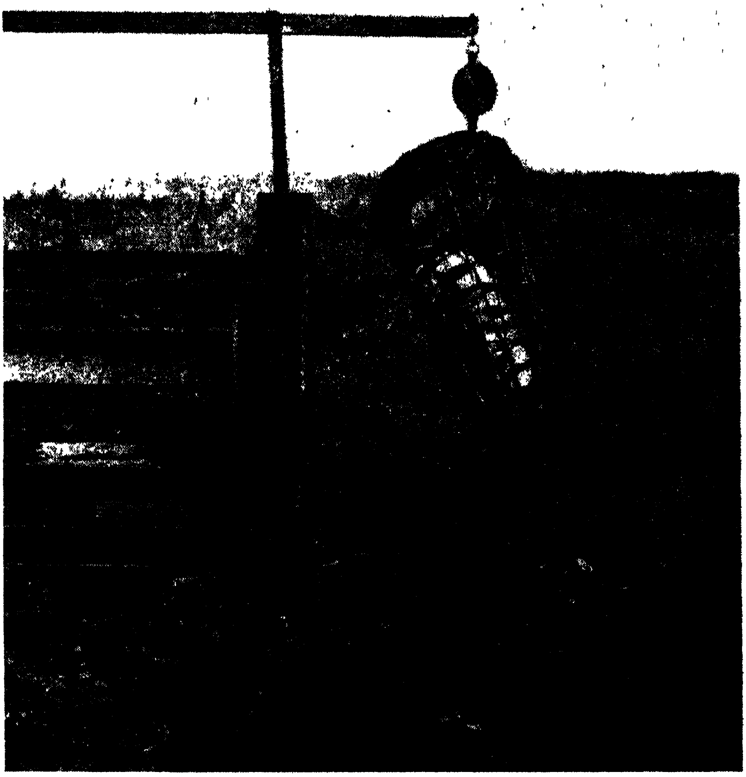


Plate 54.

Spring Balance and Basket in use.

To strengthen the hard-wearing parts, especially the bottom, small canes are interwoven to form a close-filled cap. Upon completion the weight of the basket ranges from 23-25 lb. when green, this being reduced to 16-18 lb. when dried out.

It is not anticipated that the average farmer will be able to make these baskets, but with the description given, together with the illustration (plate 51), any basket-maker of repute should have no difficulty in making them.

The spring balance used has been of the "Salter" type and capable of weighing up to 300 lb. The only other equipment necessary is an upright beam made of a 6-ft. length of 4 x 2 inch timber, a lever made of an 8-ft. length of 3 x 2 inch timber, one bolt and nut, and one open eye-bolt and nut. The lever is bolted into the free end of the upright so as to make a hinged joint. In the illustration (plate 52) the basket is shown outside the pig pen for clearer definition; but in actual practice the lever is worked from outside and the basket with the pig in it is raised into the air from inside the pen.

No difficulty has been found in getting pigs into the basket, and in point of fact, after having been weighed several times, pigs have been found to walk into the baskets of their own accord. Pigs from 25 lb to 200 lb. have been weighed with ease.

◆

SWEET POTATOES AND ARROWROOT FOR PIGS.

With the approach of spring, farmers are considering their cropping programmes, and so the time is opportune for considering the value of such root crops as sweet potatoes and arrowroot as pig foods. These two crops are well known to most coastal pig farmers and can be grown in most places where there is a sufficient rainfall and a long summer season.

Under similar conditions the yield of pig feed per acre from arrowroot and sweet potatoes is several times that from maize grain. This fact alone makes these crops worthy of consideration, but they also have the advantage of being less susceptible to periods of dry weather and are usually freer from pests. In the case of sweet potatoes, some growers claim that they are worth growing for the vines alone. The vines of the sweet potatoes and the stalks and leaves of the arrowroot provide a large quantity of succulent green food.

If it is necessary to harvest and feed these crops by hand, the labour involved is considerable; but both crops can be fed off by pigs, and where the paddocks are made pig-proof, and some temporary fencing is used to partition off a small portion of the crop for the pigs to harvest, excellent results are obtained. If pigs are allowed to run over the whole crop a good deal of waste results. They should, therefore, be confined on an area which they can clean up in about one week.

Arrowroot is frequently boiled before being fed to pigs; but, although the boiling does increase its nutritive value somewhat, it is doubtful whether the increase warrants the great amount of labour required to dig, cart, and boil the bulbs, especially when it has been demonstrated that pigs do remarkably well by harvesting the crop for themselves.

Sweet potatoes and arrowroot are not complete foods in themselves, and must be fed in combination with foods rich in protein, such as separated milk or meat-meal. The more extensive use of these two crops, in conjunction with the separated milk at present available, would enable coastal dairy farmers to increase their output of pigs greatly, and this would be very desirable in the interests of the pig industry at the present time.

L. A. Downey.

Queensland Pigs Successful at Sydney Show.

QUEENSLAND pig breeders have for a long time considered their stock equal to the best in the Commonwealth, and the competition at Royal Shows in this and other States certainly provides evidence in support of this belief.

Plate 55.

Tamworth sow, Wattledale Trilby, bred by J. Barkle and Sons, Wattledale Stud, Kingaroy, and owned and exhibited by Wide Bay Stud Piggery, Gympie. Wattledale Trilby is by Wattledale Top and from Taitlands Queen.

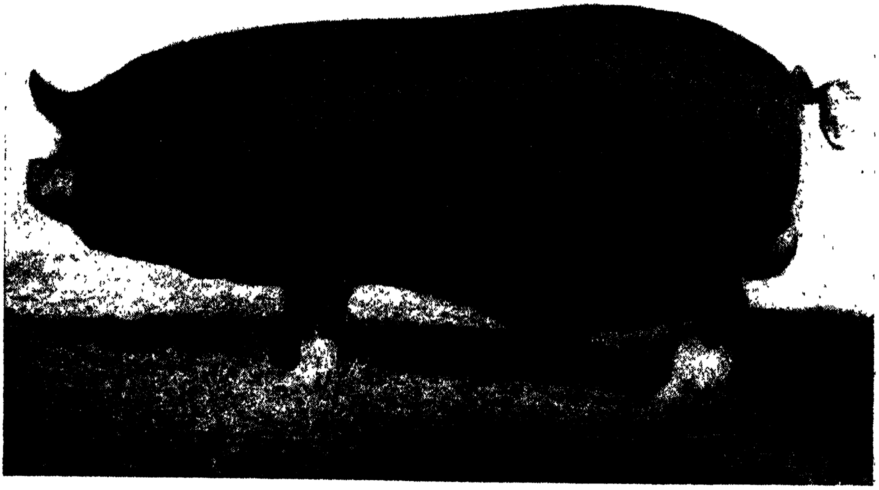


Plate 56.

Berkshire boar, Woodbine Lentonious 5th, bred by F. Bach, Woodbine Stud, Oakey, and owned and exhibited by Wide Bay Stud Piggery, Gympie. Woodbine Lentonious 5th is by Roselock Ronnie and from Lenton Patience (imp).

At the 1937 Sydney Royal Show a team of six pigs from a Queensland stud was particularly successful, winning two breed championships, four first prizes, one second prize, and one third prize.

The two champions of this team are shown on the previous page, the photographs having been taken since their return from Sydney.

Plate 57.

Farmers listening to an address on pig accommodation on the occasion of a field day arranged by the Gympie District Pig Breeders' Association on the property of Mr. W. Dawson, Wonga, via Woolooga.

The movable sheds and runs as seen in the illustration were greatly admired by visitors for their practicability and low cost.

◆

SICK PIGS ARE UNPROFITABLE.

The healthier the pigs the more rapid and more economical are the gains in live weight. Keep your pigs healthy by:—

Always having the yards and runs free of mud holes.

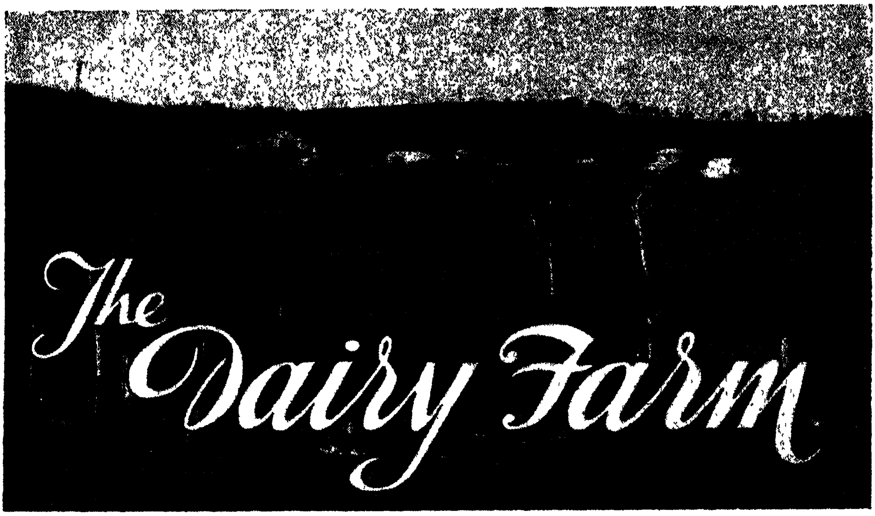
Providing clean water.

Frequently and regularly cleaning and disinfecting.

Keeping quarters dry, clean, and free from draughts.

Feeding proper rations.

Grazing pigs on clean pasture.



Factors in the Contamination of Milk and Cream.

E. B. RICE, Dairy Research Laboratory.

OF all the factors responsible for depreciating the quality of milk and cream, the activities of bacteria, the most lowly forms of life, easily assume major importance. Milk from the udder of a healthy cow contains very few bacteria, but it is not long before many are added from various sources. The chief points from which these may enter are:—

1. The cow.
2. The milker.
3. Water.
4. Bails and surroundings.
5. Air and feed.
6. Utensils.

The Cow.

Milk from the udder of a healthy, well-fed cow contains very few bacteria, these being mainly types which have entered through the teat canal, and, fortunately, they are very slow in bringing about changes in milk. However, the milk from a diseased beast may have an abnormally high bacterial content which would infect the milk from other animals mixed with it. Furthermore, such milk might spread the disease amongst persons or animals consuming it.

Immediately after it is drawn from the udder, the milk becomes more or less contaminated, the bacteria falling from the coat of the animal with dust particles and loose hairs. It is therefore necessary that animals should be kept reasonably clean, and that the udders and near portions of the body should be wiped with a damp cloth, moistened with weak Condy's fluid. The wiping of the udders is also beneficial for the reason that bacteria cannot fall from a wet surface. The number of germs ordinarily dropping from the coat of the animal into the milking pail is considerable. An investigation of the matter has shown that in a dairy where the animals were divided into two groups, the group whose udders were not wiped added an average of 7,000 bacteria per cubic centimetre (about ten drops) to the milk, whereas the group whose udders were wiped contributed an average of only 700 bacteria per c.c. However, attention should be called to the necessity for frequent changing of the cloths, as the benefits will be lost if one rag is used for, say, twenty cows. A further essential is that the cloths should be boiled after each period of use and hung to dry in a dust-free place.

The Milker.

Many dairymen fail to recognise the extent to which the milker influences the quality of the product. Material from the hands, clothing, and mouth of the person gets into the milk, the extent of the contamination from this source depending upon the personal habits of the individual. Disease germs, too, may enter the milk from a person suffering from disease, possibly causing a widespread epidemic in a district. Clean hands and clean clothing are important considerations in the hygienic production of milk, The hands should be washed immediately before milking each cow; and clean overalls, kept only for milking, would be a decided advantage. Facilities for washing the hands, such as a washbowl, water, soap, and towels, should be provided in every dairy.

Closely related to the milker is the question of sanitary methods. Figures quoted by an American authority reveal the fact that, on ten farms where the milkers were inexperienced in cleanly methods, the bacterial counts averaged 2,500,000 per c.c. When ten men experienced in sanitary methods milked on the same farms the counts were reduced to an average of 9,000 bacteria per c.c. In another investigation carried out on ninety farms in two months of one year, before sanitary methods were introduced, the bacterial counts averaged 393,000 per c.c. On the same farms in the same months a year later, after sanitary methods were adopted, the counts on the milk averaged 55,000 per c.c.

The methods by which these results were achieved were: —

(1.) Washing the udders free from dirt and milking with clean, dry hands.

(2.) Sterilisation of pails, cans, strainers, &c., with boiling water.

(3.) Cooling by submerging the cans in tanks of spring or ice water.

Water.

Clean, pure drinking water is required for dairy stock. Water from stagnant pools, dams, &c., is a menace to cream quality, for the animals wading into such places pick up microbes on their coats which later, during milking, fall from the body into the pail. The microbes rapidly multiply in the favourable food medium. In this manner such common faults as ropiness and gassiness often originate; and the microbes, once established in the bails and utensils, become difficult to eradicate. Careful attention should be devoted to the wiping of the udders of animals which have access to polluted water, and, if possible, it should be fenced off.

Buildings and Bails.

Milk of good quality can be produced where bails, buildings, and yards are not elaborate, but where precautions are taken against factors known to militate against cleanly production. In fact, the writer has in mind a dairy in Brisbane which produces certified milk, such milk having to conform to a maximum bacterial content of 30,000 per c.c., which is regarded in all countries as a fairly rigid standard. It is safe to assert that the buildings on this farm would be no better than those on 50 per cent. of the farms in any of the leading dairying districts of the State; but sound methods are the secret of this man's success.

Liberal applications of lime to the floors and the whitewashing of the walls of the bails at regular intervals check bacteria. The daily carting away of all manure which has accumulated in the yard and on the floor of the bails is a matter of routine in any well-kept dairy. If this is not done, the manure becomes pulverised into dust, which is blown about the buildings and ultimately gets into the milk. Among the microbes found in manure are types responsible for gassy fermentation, which is most objectionable. The handling of dirty leg-ropes and stools without washing the hands afterwards is a practice which calls for condemnation. Good ventilation and plenty of sunlight help to achieve choice quality, and so the bails should face the north to gain the maximum benefit from the natural light.

Air and Feed.

The air in the bails, so long as the yards and floors are kept in proper order, has not such a serious contaminating influence as might be expected. The microbes which are transported by dust particles have to be of resistant species or they are destroyed by the direct sunlight, absence of moisture, and lack of food. On the other hand, with a dirty and dusty yard, the air is literally teeming with millions of microbes, many being very injurious to milk. The feeding of hay and silage during milking should be discontinued, because yeasty cream and other defects are brought about by microbes in the dust from such foods.

Condition of Utensils.

Of the original bacterial contamination of milk and cream, 80 per cent. is traceable to a failure to keep the utensils thoroughly clean. Boiling water should be used after all traces of milk solids have been removed. This is done by first rinsing the utensils with cold or lukewarm water to dissolve the albumin, which would coagulate and form a thin film on the surface of the utensils if hot water were brought directly into contact with it, but which is soluble in cold or warm water. The vessels are next scrubbed with hot water in which washing soda has been dissolved. A scrubbing brush should be used for this purpose, as cloths would be ineffective. The utensils should then be submerged in the boiling water for at least one minute and then placed on the draining rack so that the water can run off. Their heat causes them to dry rapidly. Since all bacterial food is removed by washing, all bacteria killed by boiling water, and all moisture drained away or evaporated by the heat, any few bacteria which may re-enter from the air of a hygienic dairy will not cause undesirable changes in milk subsequently placed in the utensils.

CARE OF MILK AND CREAM.

After the milk or cream is produced care must be taken to avoid any further contamination and to prevent an increase in the numbers of the germs which have entered, otherwise all efforts previously expended in producing a choice quality article may be forfeited.

Some of the chief factors in the development of after-production faults are:—

1. The state of the dairy.
2. Improper cooling.
3. Care during transit to factory.
4. Faulty containers.

The Dairy.

Many old-style dairy houses, through lack of proper ventilation, are veritable hotboxes. At the high temperatures in such dairies on hot summer days the bacteria will multiply with enormous rapidity and nullify all efforts made to keep them in check during the previous handling. The recent amendments to the Dairy Produce Act have remedied this matter by providing for a new type of dairy house which ensures more adequate ventilation. In this new dairy with gauze or wire-netting at the top and bottom it will be necessary to cover the cream to prevent contamination in dusty weather. Where sufficient water is available the inclusion of a concrete trough about 8 inches deep by 2 feet 6 inches wide in the southern end of the dairy is an aid to the cooling of cream, but frequent replacement of water is required in order to ensure satisfactory conditions.

Cooling.

The difficulty in the way of cooling in many of the dairying districts of this State is fully realised; but it is nevertheless considered that much more could be attempted by progressive farmers than is usually done at present. The provision of a trough, or the use of a surface cooler, enables a proper cooling of the cream to be effected immediately it is separated. The writer has inspected records kept by farmers who have installed coolers, and in every instance it was observed that, even on the hottest days, the cream rarely rose more than a few degrees over 70° F.

A significant fact also was that, since the adoption of cooling, second-grade cream has been unknown. A cheap cooler can be procured from factories or stores in dairying districts for about £2. The importance of keeping cream at from 60 to 70° F. lies in the fact that the lactic acid bacteria which are required to bring about the desired ripening of cream are most favoured by this temperature range, their growth being so rapid that other species are gradually destroyed, or are prevented from multiplying. At higher temperatures many undesirable bacteria are able to compete with the lactic acid bacteria, resulting in the development of "off" flavours, such as gassy, yeasty, rancid, cheesy, and unclean or tainted cream.

Transit to Factory.

During its transit to the factory the cream should be protected from direct sunlight in waggons which are covered by a suitable hood. The development of tallowy and metallic flavours is accelerated by heat and sunlight. Direct sunlight will turn milk tallowy in ten minutes; and in diffused light the taint will sometimes appear in forty-five minutes. Cream should not be conveyed in waggons which are also used to carry odoriferous products, owing to the ease with which cream will absorb odours from its surroundings.

Faulty Containers.

Faulty cans are a menace to the cream contained in them. Badly dented, rusty cans, or cans from which the tinning has worn off, will quickly deteriorate their contents. Their influence can be gauged from recent research in England which has shown that 0·2 parts of copper, or 2·0 parts of iron, per million will affect the flavour of butter. In this connection, the harmful effect of using kerosene tins on the dairy is often overlooked. In addition to the possibility of inducing metallic flavour, bacteria which lodge in the seams of these tins are injurious to quality.

Anyone who will use reasonable care can produce milk or cream of choice quality. Elaborate equipment is not necessary, but simply an understanding of the methods of preventing contamination from various sources.

FEEDING ON THE DAIRY FARM.

Finely-ground cereals should be used in the early stages of a calf's life. Under the systems for the rearing of calves in Queensland, the cereal meal is first introduced into the ration about the second or third week. As the animal grows, and is better able to cope with it, the grain may be less finely ground; and, by the end of the third month, only the very hard grains require crushing. The first year of a calf's life is the period in which it masticates most thoroughly. From then on, the proportion of whole grain that passes through undigested gradually increases. The reverse is true of the roughages. It rarely pays to chaff or mill hay for calves.

With the milking cow productivity may govern the method of preparing the food. Further, when certain foods which are normally ground or crushed are low in price, the extra production which results from grinding may not pay for the cost. An exception must be made when stock are being prepared for exhibition or test.

It is a safe rule always to crush corn. All concentrates for high-producing cows should be in meal form. This does not mean that the food must be powdery. Excessively fine meals are usually dusty, and unless moistened with molasses or water, they are wasteful; furthermore, the irritation they cause when taken in with the breath may actually induce a dislike for a good food.

Roughages are usually fed uncut. Stalky or unpalatable roughage may be chaffed to encourage consumption or to make the inclusion of a concentrate simpler. Food which is to be moistened with molasses should be chaffed.

The fine chaffing of hay for dairy cattle is not justified even for stud or exhibition cattle, as it impairs digestibility by suppressing rumination. Whole plant feeding is often employed, e.g., corn and sorghums. The coarse chaffing of the sweet sorghums is necessary. Grain crops require better treatment—it may even pay to chaff, though as a rule whole plant feeding of cereals should be done as silage.

How to Keep Churns Sweet.

J. D. OGILVIE, Dairy Instructor.

Butter absorbs foreign odours very rapidly. If the churn is not kept in a pure and sweet condition, the butter will be exposed to undesirable odours and its commercial quality will be impaired. The best cream will not produce a high-grade butter if a foul-smelling churn is used.

A churn should be given two rinsings at the conclusion of each day's churning—the first with lukewarm water, and the second with scalding hot water.

Some butter-makers turn the churn over with the cover hole down; others prefer to have the cover hole turned up. When the churn is turned with the cover hole down, the remaining steam on the inside of the churn cannot escape. It will condense inside the churn, and cause it to remain in a damp condition overnight. If, however, the churn is turned with the cover hole up, the dust and other impurities, if present, are likely to settle in the churn.

The best method is to turn the churn over so that the cover hole points to one side. The steam then can escape, and the heat absorbed from the boiling wash water will dry the churn thoroughly. The churn, however, should be drained thoroughly first, as otherwise some water will remain in the bottom.

Some makers rinse the churn only once and use scalding hot water. This method is likely to scald the remaining curd on to the wood. One rinsing is not enough to ensure a clean churn. The first rinsing with lukewarm water removes the major portion of the buttermilk and brine, and, to a certain extent, warms and preheats the wood of the churn, so that when the second rinsing with scalding water is completed, the churn receives the full benefit of the scalding. In addition, the churn is clean and no food on which germs can thrive is left. The churn is left warm, and in that condition will dry out quickly. If the churn is cleansed in the manner described above, and then, at the end of the week, treated with freshly slaked lime, it can be kept in a sweet condition.

A bucketful or two of the liquid lime will be sufficient for each churn. If the churn is rotated a few times, the lime will spread over the inside of it. The churn should be allowed to remain in this condition until ready for use again. Before it is used again, some warm water should be put into it, and the lime will readily come off; but, if it has been allowed to remain in the churn too long, it will form a lime carbonate and will be more difficult to remove. Lime is the safest and one of the best disinfectants and deodorants that can be used in a factory. Some factories use it every day on all wooden utensils, such as butter workers and packers.

COTTON.

The harvesting of cotton is still in progress, but most of the consignments now being received at the ginneries consist of scrap cotton, an indication that the season is drawing to its close. Considering the extremely dry conditions that ruled throughout most of the cotton areas until December, and the long periods of excessive heat which followed, the quality of the cotton picked this season has been remarkably good. There was considerably less of the yellow-spotted grades, and an increase in the percentage of mature grades, particularly in the case of the newer hard-bodied varieties of medium staple. As this class of cotton is required by the Australian spinners, the progress made with these varieties is of special importance.

Steady, soaking rain is urgently required in all cotton areas to allow of the preparation of seedbeds, and to replenish subsoil moisture, a most important factor in the successful growing of cotton, because of the deep-rooting system of the plant.

The distribution of seed has commenced, and applications are coming in steadily.

SUGAR.

During the early part of July, rather cool, dry conditions prevailed in all cane areas; this checked effectively the growth of the mature crop, while frost caused slight damage to young cane in isolated areas.

Good rains were experienced in the far North during late July, while the drought conditions in the southern districts still persist.

Many of the mills are now in operation, and the cane is generally above normal in sugar content. Crops appear to be cutting up to estimate, so that there appears every possibility of a 700,000-ton sugar crop.

A Tractor Operated by Suction Gas.*

G. A. CHRISTIE.

HITHERTO the use of suction or *producer* gas has been confined, more or less, to stationary engines. Attempts have been made to design a suitable generator for use with motor vehicles, and these have proved satisfactory under certain conditions; now a farm tractor which has been designed to use producer gas as the explosive mixture has been manufactured by the Howard Auto Cultivator Works.

The principle of operation is that a mixture of combustible gases is formed when charcoal which has been moistened is burnt in a limited supply of air. In the same way that petrol vapour ignites with a spark when mixed with air, so producer gas burns and expands. to provide the power stroke of the engine. In designing the gas generator (see plate 56) the manufacturers have endeavoured to combine efficiency in working with economy of space and ease in operation.

Plate 58.

Illustrating the Tractor operated by Suction Gas.

The tractor, which develops 40 horse-power, is fitted with a 5-feet rotary hoe; this is easily detachable and the tractor may be used as a stationary engine, or any other implement may be attached for cultivation purposes. The hydraulic lift by which the hoe is raised is rapid in action, and thus allows cultivation to be carried closer to headlands than is the case with a slower type of lift. The tractor is fitted with a full set of pneumatic tyres, which enables it to be driven with comfort, and without any adjustment, over highways. It is also claimed that they give a higher general efficiency in operation. The unit is fitted with self-starter and headlights, the power for which is developed through a 12-volt battery.

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* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations) for July, 1937.

Before starting any tractor it is necessary to check the various oil and water levels, to grease the several points, &c., which jobs usually occupy about twenty minutes. With the suction gas tractor, it is found that if the fire is started before commencing this work, gas may be produced by the time the examination is complete. Thus the period elapsing between lighting up and the operation of the engine on gas is not more than thirty minutes. The engine is started on petrol, and is gradually switched over to the gas. This phase occupies only four or five minutes at each starting. The producer is refilled with charcoal at intervals of one hour, and since the engine is not stopped, very little time is taken up in that operation.

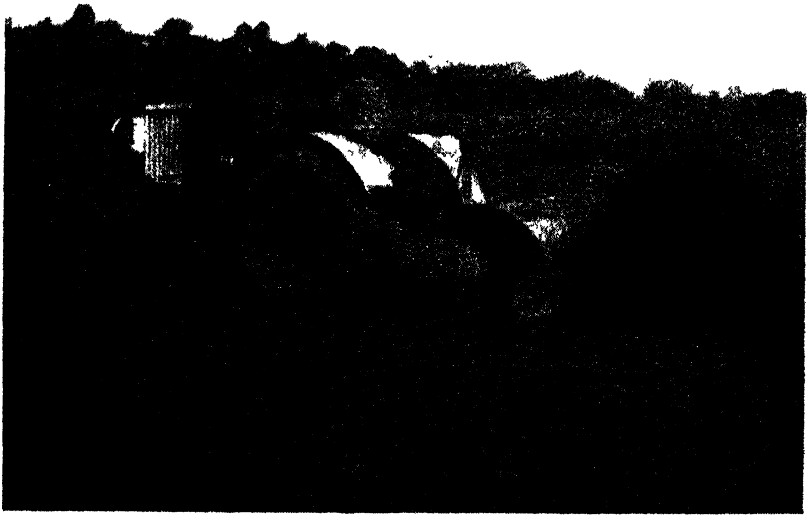

Plate 59.

Suction Gas Tractor with Rotary Hoe Attachment.

Since its introduction to the Bundaberg area, Messrs. Douglas Bros., of South Kalkie, have kept accurate records of all costs of operation. The tractor and rotary hoe have been used in ratooning cane, cutting and turning under trash and green manure crops, and in normal cultivation of fallow land. The average depth of working (except in ratooning) is 9 to 10 inches of firm soil. In the 233 hours

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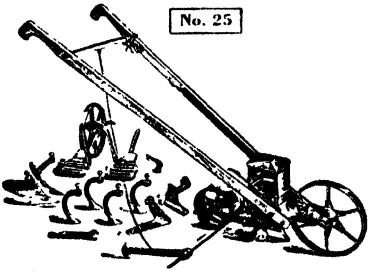

No. 25 Seeder, Double and Single Wheel Hoe, complete with all Fittings (as illustrated)	£5 15 0
No. 4 Seeder, Single Wheel Hoe, complete with Cultivator Teeth, Hoes, and large Plough	4 17 6
No. 4 Seeder, bare—No Fittings ..	4 10 0

These machines will plant seeds such as Onions, Carrots, Turnips, Peas, Beans, Beet, &c. They plant, cover up, and roll. They will plant three or four times as much in the same time.

No. 17 Single Wheel Hoe, Cultivator, and Plough	1 18 6
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No. 11. Same as No. 12, with four Rakes additional	3 5 0

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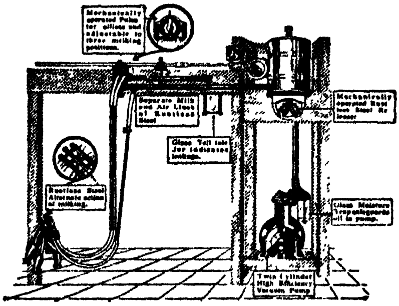
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Glass Tell-tale Jar indicates leakage.
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Twin Cylinder High Efficiency Vacuum Pump

MILKING PLANTS

Entirely unaffected by milk. Completely resistant to Caustic Soda. Solid Stainless Steel right through. All tubes are polished internally—making them Hygienic and easy to clean.

Quite apart from the wonderful advantages of Stainless Steel, it will pay you to consider the many advantages in the design of the Plant itself.

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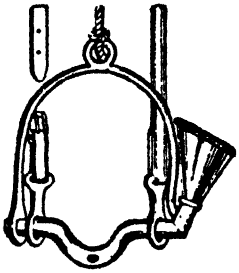

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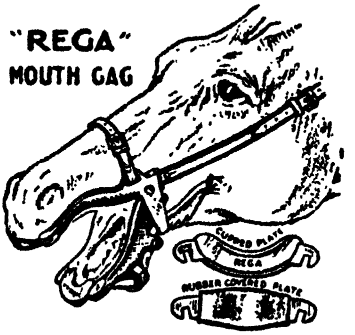

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of operation, 140 acres have been cultivated with the following operating costs:—

	£	s.	d.
Charcoal—187 bags at 1s. per bag	9	7	0
Lubricating oil—changed every 40 hours—12 gallons at 5s. 5½d. per gallon	3	5	6
Petrol for starting—9 gallons at 1s. 10½d. per gallon	0	16	11
Gear lubricant	2	9	6
Total	£15	18	11

It will be seen that the running costs per acre with the rotary hoe have been less than 2s. 3½d., while the hourly cost of operation is less than 1s. 4½d., excluding the wages of the driver. From these figures it will readily be appreciated that suction gas may be employed profitably in farm tractors, without any loss of efficiency, where a plentiful supply of cheap wood for charcoal production is available.

◆

MEATWORKS BY-PRODUCTS.

Meatworks by-products are all of organic origin, and vary in composition with the part or parts of the animal used in their preparation.

Blood is used either as a foodstuff (blood meal) or as a fertilizer (dried blood), depending on the quality of the manufactured product. Blood meal is not available on the Queensland market and requires no discussion here. Dried blood contains 81 per cent. crude protein (nitrogen 13 per cent), and other organic matter plus moisture 19 per cent. It is a widely-used nitrogenous fertilizer, comparable in many respects with sulphate of ammonia in the rapidity with which the nitrogen is available to the plant.

Bone is finely ground in the preparation of bone flour, bone meal, and bone dust. An average quality bone dust contains crude protein 22 per cent. (3½ per cent. of nitrogen), tricalcic phosphate 50 per cent. (23 per cent. phosphoric acid), and other organic matter plus moisture 28 per cent. Bone dust is a slow-acting phosphatic manure. The more highly-refined products find an outlet as a constituent in many stock licks, which are valuable for stock grazing on phosphate deficient soils.

Waste flesh is the basis of meat meal, the dried residues being finely ground. It invariably contains a certain amount of bone. Meat meal (crude protein 63 per cent.), like blood meal, is an excellent protein concentrate for stock and the available supplies are readily absorbed on the Queensland market. It also contains fat. When used for fertilizer purposes, the fat is first extracted during preparation.

Meatworks manure is a mixed product containing blood, bone, and waste flesh. It contains approximately 6 to 3 per cent. nitrogen and 14 to 23 per cent. phosphoric acid, and is widely used in the State. It should be noted that as the nitrogen increases the phosphoric acid decreases, and *vice versa.*

All bone flour, bone meal, and meat meal products used for feeding animals must be subjected to a steam heat at a temperature of not less than 250 deg. F., equal to an indicated steam pressure of 30 lb. per square inch for at least two hours during the manufacturing process. They must be prepared only from animals slaughtered for human consumption.

F. C. Coleman, Dairy Branch.

Summer Fodder Crops in the Maranoa.

C. H. DEFRIES, Instructor in Agriculture.

THE possibilities of summer hay and fodder crops for early spring planting, if the weather is favourable, are now engaging the attention of farmers in the Maranoa district. Land for such crops should, of course, be prepared now. Ploughing may be impracticable until it rains, but there are many paddocks already prepared for wheat which could not be sown during the dry weather. When replanting these areas it would be advantageous to reserve at least a portion of the area for summer fodder crops.

Pre-eminent among the fodders suited to the district is Sudan grass. The risk of prussic-acid poisoning associated with this crop can be reduced by purchasing seed from a reliable source to ensure freedom from contamination by the more toxic sorghums. Careful grazing is also necessary. Stock should not be fed on young crops, or crops which have been checked in any way during growth. It is also inadvisable to turn hungry cattle into a Sudan grass paddock.

Plate 60.

CUTTING A HEAVY CROP OF SUDAN GRASS.—A harvesting scene on a Central-Western pastoral holding on which fodder cultivation is practised extensively.

Good quality hay can be made from Sudan grass in the Maranoa, and it constitutes a valuable standby for all stockowners during winter or other dry periods. Fine-stemmed plants are preferred by stock, and facilitate both harvesting and curing the hay. For this reason, wide drills which strain the cutting mechanism of a mower or binder and tend to develop coarse plants should be avoided. Planting with the wheat drill, at the usual spacing for wheat, gives excellent results if the seed is sown at the rate of 7 lb. per acre.

As a quick-growing crop Japanese millet is coming into wider cultivation on the better loams of the eastern portion of the district.

The crop may be grazed when quite young, and in feeding off there is no risk of stock poisoning. For best results, however, it is wise to allow growth up to 9 to 12 inches. The hay is good, although yields are not so heavy as Sudan grass; 10 to 12 lb. per acre is the usual sowing.

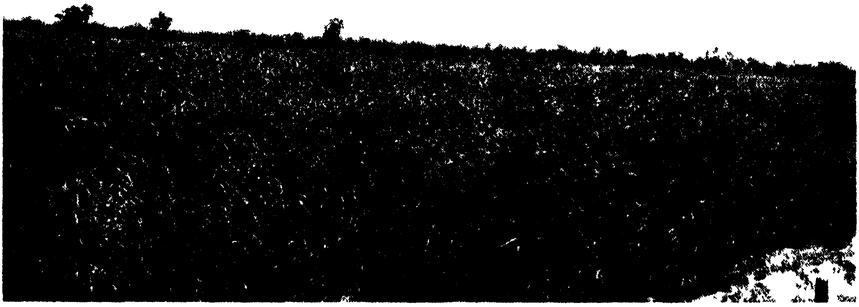

Plate 61.

A FIELD OF SUDAN GRASS.—A crop grown for fodder on Coreena, a pastoral property near Barcaldine.

West of the Darling Downs cowpeas are not in general use for fodder or hay, although they do well enough on the lighter soil types and form a very useful supplement to other fodders. Stock often show a dislike to the fresh green growth when they are not used to it, but eat it readily when cut. The value of this legume in supplying a protein supplement when fed with native pasture, and its capacity to enrich the soil through the action of nitrogen fixing bacteria in the nodules of the roots, should not be overlooked—particularly in sandy soils where native legumes are of little consequence.

Broadcast sowings of half a bushel are usually made with small seeded peas such as Poona. When sown in rows, 8-10 lbs. of seed is sufficient.

GROW COTTON.

Cotton growing in the south-eastern portion of Queensland is at the present time in an unique position, as it represents one of the few primary commodities for which there is an unfulfilled demand in Australia. Since the last Commonwealth Bounty Act came into operation, there has been a rapid expansion in the cotton spinning and manufacturing industries in Australia, with a resultant increased demand for raw cotton.

The cotton industry is established on a co-operative basis and is one of the few industries in which the product grown is handled by the growers' organisation from the field to the manufacturer. This organisation, the Queensland Cotton Board, takes control of the seed cotton when it leaves the farm, transports it to the nearest ginnery, gins the cotton, markets the lint, and manufactures by-products, all the resultant profits being returned to the grower.

For the past two seasons the average return paid to growers for seed cotton delivered at their nearest railway station has been approximately 4d. per lb. of seed cotton, and, considering the increased demand by the farmers for the high lint percentage cottons, it is assumed that the average net return of 4d. per lb. will be maintained at least for the next three years.

The advantages of cotton as a rotational crop in any farm system, and especially in conjunction with dairying, should appeal to most farmers and primary producers. Over a number of years, cotton has proved its adaptability to the conditions within the cotton belt and can be successfully grown on most of the main soil types within this area. It undoubtedly offers distinct advantages over many other crops on account of its drought-resistant qualities, and in the past two seasons, which have been particularly severe ones, profitable yields have been obtained where other crops failed or gave only poor returns.

The suitability of cultivations newly broken up out of the original grasslands has been studied carefully for several years, and it is obvious that substantial benefits are obtained on most soils when cotton is grown in rotation with pastures of a sufficient stage of establishment. The benefits which may be expected can be grouped under three headings—increased yield per acre, improvement in lint quality, and reduced costs of production.

Observations have definitely shown that new cultivations, or recently ploughed Rhodes grass paddocks, produce heavier yields of lint cotton than do adjacent cultivations on which crops of cotton have been grown for more than five years in succession. The explanation of the increased yields may be found in several factors. The more important are the restriction of the soluble plant food nitrate-nitrogen in the soil to levels most suitable for the cotton plant and the maintenance of adequate supplies of organic matter (roots, leaves, stems, &c.). The latter prevents the soil particles from packing and gives to the soil an open texture that allows of the quick and complete absorption of ordinary storm rains.

Another important feature of the pasture-cotton rotation is the reduction of production costs, brought about by the lessened number of workings required to keep the field clean in the first three or four seasons after being brought under cotton. Weed and grass growth is less, and the surface does not become compact with the occurrence of heavy rains.

To establish the Queensland cotton growing industry on a firm basis, it is incumbent upon the growers to supply fully the requirements of the spinners, and to accomplish this increased areas are necessary. When the general suitability of cotton for most of the soil types of the south-eastern portion of this State is considered, it becomes all the more apparent that growers cannot afford to exclude cotton from their system of farm cropping.

R. W. Peters.

In Memoriam.

ALFRED ERNEST GIBSON.

OF the late Mr. Alfred Ernest Gibson, Director of Agriculture in Queensland, whose death occurred at his home at Manly (Q.) on 8th July, it may be said with truth that his life was one of devoted service to the State. His illness had been a protracted one, and the end was not unexpected; but, nevertheless, the news of his demise came as a shock to his friends and associates in the Department of Agriculture and Stock, by whom he was held in high esteem and affection. The intimation of Mr. Gibson's death also called forth expressions of deep regret from primary producers in various parts of Queensland who had learnt to appreciate his merits as an authority on agricultural methods, as well as his fine qualities as a man.

Born in Victoria in 1873, the late Mr. Gibson graduated as Dux of his year from the Dookie Agricultural College in that State in 1890. He gained a varied experience as manager of butter factories in Victoria, as manager of sheep properties in the western part of that State, and in dairying, general farming, and fruit-growing. Before coming to Queensland, he was engaged in farming on his own account in the Maffra district in North Gippsland. He left for Queensland in 1909 and joined his brother, a surveyor, in the field study of soils, grasses, and timbers in the central-western portion of the State.

In 1911 Mr. Gibson accepted an appointment in the Department of Agriculture and Stock as farm foreman at the Queensland Agricultural College, Gatton. Two years later he was promoted to the position of overseer and experimentalist at the college. He was appointed instructor in agriculture, with headquarters in Brisbane, in 1914, and fourteen years later became senior instructor. In 1933 he was appointed Acting Director of Agriculture, an appointment which was subsequently confirmed. Mr. Gibson also acted as deputy for the Director of Marketing on various commodity boards, and was a Government representative on the executive of the Council of Agriculture.

The announcement of Mr. Gibson's election for the position of Director of Agriculture in 1933 was received with approbation by the primary producers throughout Queensland, because there was a general feeling of confidence in his ability to discharge

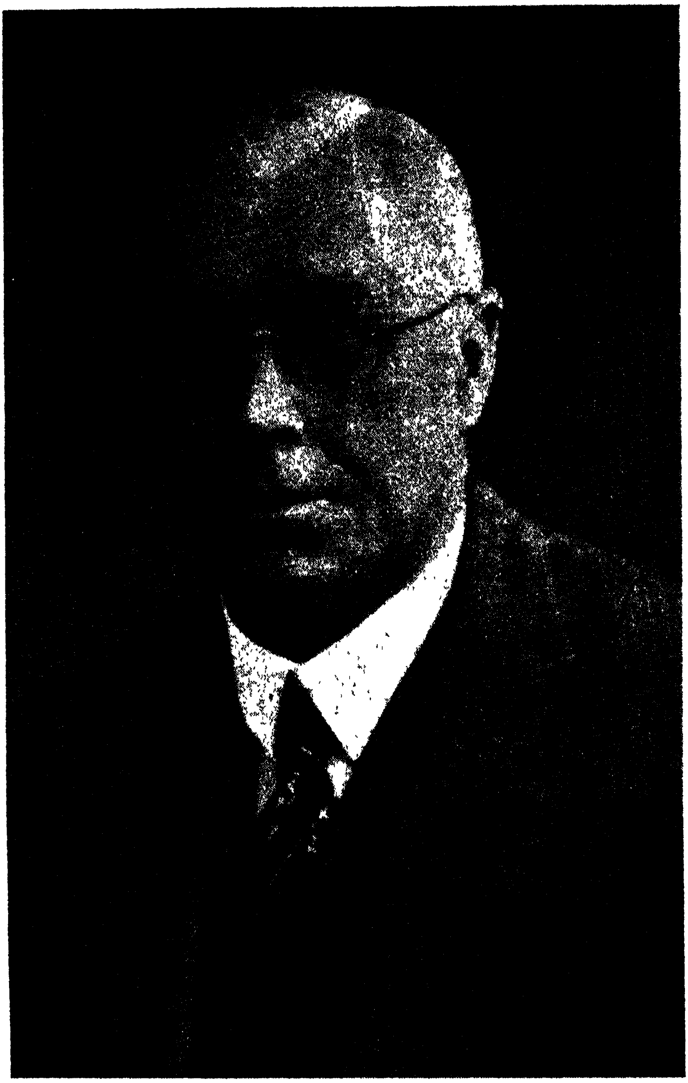

Plate 62.
THE LATE A. E. GIBSON, DIRECTOR OF AGRICULTURE.

satisfactorily the onerous duties of the position. It was widely recognised that Mr. Gibson had a thorough knowledge of agricultural science and practice which fitted him for the task of directing the activities of so important a branch of the Department of Agriculture and Stock.

Devotion to duty, earnestness, thoroughness, and a keen personal interest in the work on which he was engaged were outstanding characteristics of the late Mr. Gibson. His mind was essentially practical and efficiency was his primary aim. Allied with these admirable attributes was an unassuming and tolerant attitude to all with whom his duties brought him into contact. At no time did he attempt to dictate to the man on the land as to what he should do, but he sought to help him with advice which he was ready always to justify and support by logical reasoning. In this way he was able to inspire confidence as a practical man whose guidance in respect to the varied and complex problems associated with the growing of crops and the care of domestic animals might safely be followed. His home and his garden, fishing and cruising on Moreton Bay in his fine power yacht—the work of his own hands and a triumph of the boat builder's craft—were "Gibby's" leisure-time hobbies.

TRIBUTE BY THE PREMIER.

The Premier (the Hon. W. Forgan Smith, LL.D.), on behalf of the Government, tendered sympathy to Mr. Gibson's widow and family in their bereavement. The deceased gentleman had given many years of valued service to Queensland, he said, and up to the time of his death he was directing many experiments of great potential value to primary producers, and his loss would be felt severely.

MR. BULCOCK'S EULOGY

"It is with deep sorrow that I learnt of the death of Mr. Gibson," said the Minister for Agriculture and Stock (the Hon. Frank W. Bulcock).

"Mr. Gibson joined our service in 1911, and during the whole of his association with the department he made material contributions to the well-being of agriculture. Many farmers settled throughout Queensland will have kindly recollections of Mr. Gibson as an instructor and experimentalist at the Gatton

Agricultural College. Later, in his associations with experimental work, he achieved a degree of success which few people gain in the services of agriculture.

"Mr. Gibson was actively associated with the economic side of the industry and was Government representative on several pool boards, the more important of which were the wheat pool and the plywood and veneer pool. Here his business acumen and long association with farming problems enabled him to make very valuable contributions to economic organisations associated with this department.

"I feel that not only have I lost a very valuable officer, but one whose counsel was always sound and worthy of serious consideration.

"Last year Mr. Gibson fell ill, and some doubt was expressed about the possibility of his recovery, but, while he was still a very sick man, he insisted upon returning to the department to carry on his duties. During his recent illness every unit of the Service, including myself, felt his absence greatly.

"Mr. Gibson's work for agriculture has made his name a family word wherever farming problems are discussed, not only in Queensland but in agricultural councils throughout Australia.

"I can only offer my very sincere sympathy to his widow and family."

Flags were flown at half-mast over the head office of the Department of Agriculture and Stock in Brisbane and at branches throughout the State on the day on which Mr. Gibson's death was announced and on the day of the funeral. After a brief Service at his home, the interment took place in the beautiful bushland cemetery at Hemmant, in the presence of a large gathering of his friends and former associates, among whom were representatives of the State Government and Parliament, of every branch of the Department of Agriculture and Stock, of the Council of Agriculture and associated farmers' organisations, of the Royal National Agricultural Association, of the Faculty of Agriculture within the University of Queensland, of the Ex-Students' Association of the Queensland Agricultural College, and of the commercial life of the city. He left a widow, two daughters, and a son to mourn their loss.

Some Tropical Fruits.

No. 16—THE GRANADILLA.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

TWO very similar fruits are known by this title—namely, *Passiflora quadrangularis* and *Passiflora macrocarpa.* Both are commonly grown in North Queensland, although the former is of the greater commercial value, and consequently more frequently met with in orchards. The latter is more favoured by home gardeners.

P. quadrangularis produces a fruit about 6 to 8 inches in length and 3 to 4 inches in diameter. *P. macrocarpa* fruit is usually about 12 inches long by 5 to 7 inches in diameter.

The formation of both fruit is similar. Underlying a very thin translucent skin is a layer of greenish coloured flesh, about an inch in thickness in the *quadrangularis,* and 1½ inches in the *macrocarpa.* The inner surface of the flesh is covered with a parchment-like skin, thus leaving a fairly extensive cavity in the centre of the fruit. This cavity contains a large number of flattish seeds, each of which is in a separate pulpy sac. *P. quadrangularis* contains comparatively more pulp than *P. macrocarpa,* and this constitutes the edible portion of that variety, the flesh usually being too dry, mealy, and tasteless to be palatable. In *P. macrocarpa,* however, the flesh is crisp and juicy and has a flavour quite distinct from that of the seed pulp. With the addition of a little orange juice and sugar a very tasty fruit salad may be made by scooping out and mixing the seed pulp and flesh of this fruit alone.

Vines of Similar Habit.

The two granadillas, usually known as small-fruited and large-fruited to distinguish them, are strong-growing vines of similar habit, growth and appearance. The stems are sharply four-angled, the leaves are large, entire, ovate, light yellow-green in colour and 6 to 8 inches long. The flowers are large, 4 to 6 inches across, purple and white in colour, with three prominent stigmas and five stamens, and they are strongly and peculiarly scented.

Flowers are produced in small numbers throughout the year and odd fruits are always available. The main fruiting season, however, is during the autumn and winter months, from April onwards, during which time the vines are heavily laden with flowers and fruit in all stages of growth. At this season one of the main reasons for the greater popularity of *P. quadrangularis* with orchardists may readily be understood. Whereas a *P. macrocarpa* vine may carry ten to twelve fruit, *P. quadrangularis* may carry as many dozens of smaller fruit, in the season.

The granadilla is not very particular as regards soil. It has been noted growing quite luxuriantly on volcanic, alluvial, sandy, and decomposed granite soils. It grows on either jungle or open forest soils, but on the latter, which are often deficient in organic matter, the vines show considerable benefit from mulching.

In the jungle areas of North Queensland the vine may often be seen in a flourishing state, thus demonstrating the suitability of our tropical soils and climatic conditions to its growth.

This plant is essentially a tropical one, and although it grows and fruits in the southern latitudes of Queensland, it is only within the tropical area that it is seen growing to perfection. It is susceptible to damage by frost; hence the careful selection of a site is necessary in the sub-tropics. Within the tropics, however, no such consideration is necessary, and the rich profusion of vine and fruit produced by the granadilla in such localities as the Cairns district is ample proof of its tropic-loving propensities.

Seed or Cuttings.

The granadilla may be propagated from either seed or cutting. Seed germinates readily provided it is fresh, but the cutting is recommended on account of its more rapid growth.

Suitable cuttings may be taken from lateral growths and should be not less than 15 inches long, but may be 2 or 3 feet long with advantage. In the tropics, when the planting is done during the rainy season, it is found that cuttings strike more readily if the leaves are not removed from the portion above the ground This should be one-third to one-half the total length of the cutting. The remaining lower portion should have the leaves removed and should be inserted horizontally or diagonally in a bed of well-prepared loamy soil. They should be planted in their permanent positions in the field at the foot of the trellis posts. It is advisable to plant two cuttings in each bed in case of failures and, should both strike, one may be removed later.

The vines are grown over a trellis support. The type most favoured and giving the best results is that known as a horizontal trellis. It is erected on stout hardwood, bean, or white beech posts, spaced 10 feet apart, in two lines also 10 feet apart. The posts should be 7 feet clear of the ground to allow good head room. They support a strong frame of split rails or heavy saplings placed on their tops, the rails being connected by cross saplings at intervals of about 4 feet. Plain galvanised wire of No. 8 gauge is then run along the trellis, over the saplings at

15 inches intervals, thus forming a horizontal network of wires and saplings. Such a trellis is known as a granadilla shed. It may be built to any convenient length, and the width may be increased by adding extra rows of posts and trellis work.

Plate 63.

Granadilla Cuttings Prepared for Planting.—*a a* Cuttings prepared for dry season and southern planting. *bb* Cuttings prepared for rainy season planting.

Vines may be planted at the foot of every post; but, after the first fruiting, or as soon as the vines become too thick, every second plant should be cut out.

When raising the young vines it will be found that growth is greatly increased by providing small twiggy sticks such as thin bamboos with laterals intact pushed into the ground against the posts for the vines to cling to. As soon as they reach the top of the posts a few light, twiggy branches thrown over the top of the trellis assists the rapid spread of the vines; and, provided they are light enough, such branches soon rot away after they have served their purpose and do not encumber the trellis.

A modified form of trellis is one in which only one supporting row of posts is erected and cross-arms of 2 or 3 feet in length are affixed to the posts, three or four wires being then run through the cross-arms. This type of trellis is not often met with; and while it may be suitable in localities where the growth of vine is restricted, it is not to be recommended for the tropics, both because of the insufficient area of trellis to hold the vine, and the poor support offered to heavily laden vines. Such insufficient support results in the tearing away of portions of the vine by the weight of the fruit, and the consequent loss of the fruit.

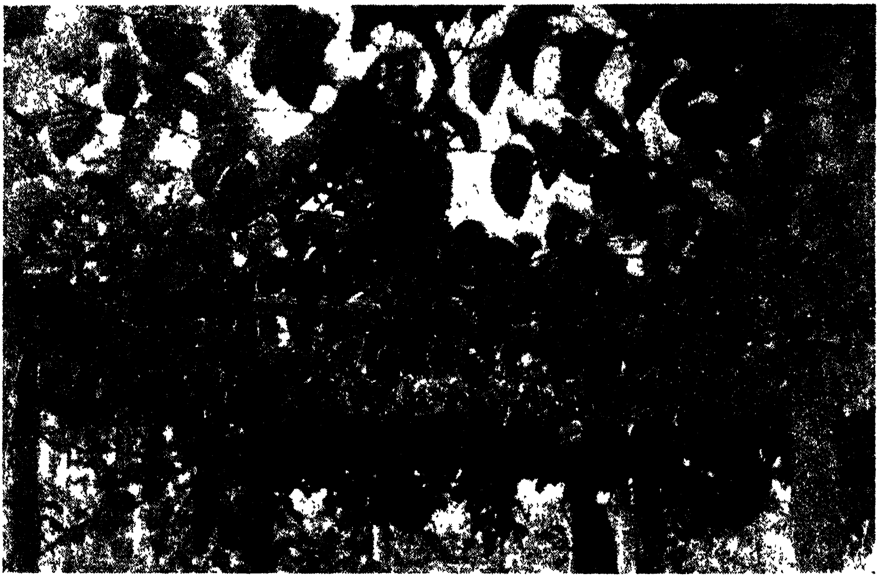

Plate 64.

Granadilla shed carrying twelve-month-old vines.

The fruit is ready for harvesting when the skin becomes clear, transparent, and glossy, and the apex shows a tendency towards yellowing. It should then be clipped from the vine and carefully placed in picking baskets or boxes lined with bagging. Chinese baskets make good picking containers, being light to handle, yet stout.

In packing for market each fruit is wrapped in a sheet of paper, and woodwool packing should be used to cushion the fruit and prevent bruising. Either the standard bushel or one and one-half bushel case is a suitable container.

In many localities natural pollination of the granadilla does not take place and artificial pollination must be resorted to, to obtain a crop. This is simply effected by gathering the ripe pollen with a feather or camelhair brush and placing it on the stigma of another flower. The cross pollination is necessary because of the protandrous habit of the granadilla that is, the ripening of the pollen in a flower before the stigma has matured and is ready to receive it.

The granadilla normally prunes itself by the dying back of the lateral growths after they have produced their crops. Hand pruning may be resorted to with advantage, however, and is sometimes necessary during the fruiting season, in cases in which the growth may be too dense.

Very little experimental work has yet been carried out with respect to the artificial manuring of the granadilla; consequently, no definite recommendation can be made in this respect. However, until more work has been done, the fertilizer recommended for the passion fruit could probably be used with advantage. The mixture recommended by the late J. C. Brunnich for that plant contains 1 to 2 cwt. nitrate of soda, 4 to 8 cwt. blood and bone, 1 to 2 cwt. superphosphate, and 1 to 2 cwt. sulphate of potash, which corresponds to a 7-10-10 mixture. He recommended also a top dressing of 1 cwt. of nitrate of soda per acre, to be applied in the spring.

Plate 65.
The granadilla flower.

Probably the most destructive pest of the granadilla is the green vegetable bug (*Nezara viridula*), which at times destroys numerous young fruits by puncturing and sucking the juices from them. Young fruits so attacked frequently wither and fall, whilst in more mature fruit hard lumps are formed in the flesh.

The treatment recommended for this pest is a spray consisting of 10 lb. resin, 2 lb. caustic soda, 3 lb. fish oil, and 40 gallons water.

Fruit fly and several species of beetles have also been known to attack the fruit at times. The method of control adopted against all these pests usually consists of enclosing the fruit, from quite an early stage of growth, in paper bags, the tops of which are tied closely round the stems. Ordinary brown paper bags have been found fairly satisfactory for this purpose. The use of such. bags, however, necessitates their removal to ascertain whether the fruit is ready to pick. Furthermore, they tend to become waterlogged and torn in wet weather. A suggestion has been put forward that celophane bags might be an improvement; and, following this up, a small experiment is now under way to ascertain what advantages, if any, these may have over ordinary brown paper bags.

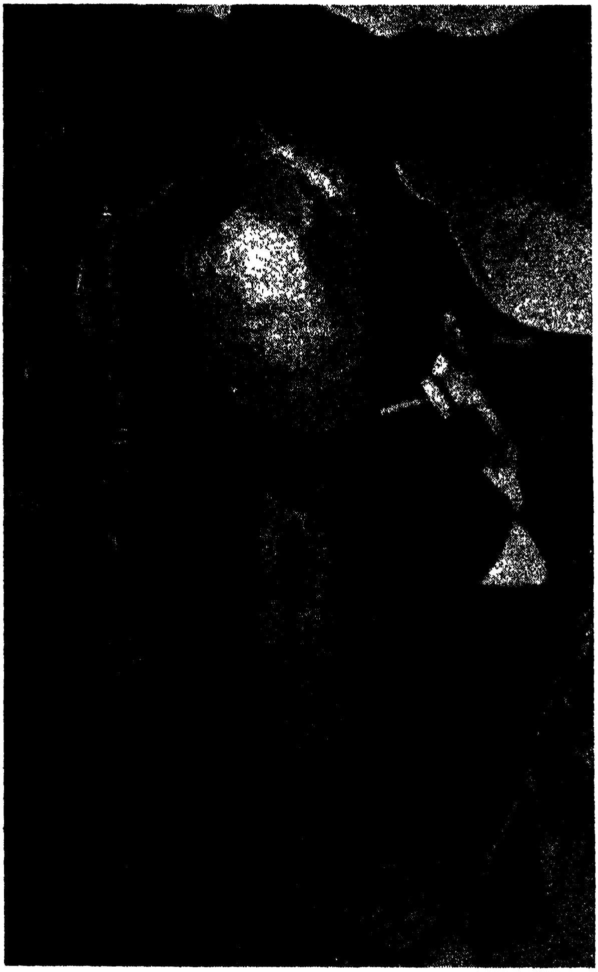

Plate 66.
Good specimens of *P. quadrangularis*.

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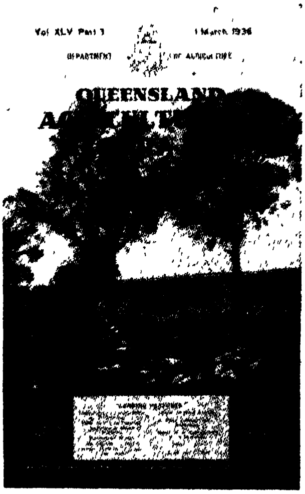

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Diseases observed up to the present have been a leaf spot and a black fruit spot, but so far they have not been regarded as serious.

Plate 67.
Granadilla attacked by the Green Vegetable Bug, *Nezara viridula.*

CULINARY USES.

The granadilla has several culinary uses, and the following recipes may be found worth while:—

Granadilla Fruit Salad.—Take one granadilla of the large variety, cut in half and scoop the seed pulp into a dish. Remove and discard the inner skin, then scrape out the flesh with a fork. Add the flesh to the seed pulp and stir in one half-cup of sugar. A little orange juice may be added, if desired. Set aside for about three hours and serve with or without cream as desired. (Note: The small-fruited variety of granadilla is useless for the above salad).

Granadilla Pie.—Scoop the seed pulp from a ripe granadilla and add about one-half cup of sugar. Remove the outer and inner skins from the flesh, cut it into cubes and place in a saucepan with sufficient water to cover it. Let it simmer until tender (about half an hour). Place the stewed flesh and raw seed pulp in a pie dish and cover with a short pie crust. Bake in a hot oven.

Granadilla Jelly.—Wash the granadillas and cut out all skin blemishes. Cut up the flesh without peeling, and put in a saucepan with sufficient water to cover. Boil for two hours. Place the seed pulp in a separate saucepan with a little water, and allow it to simmer on the side of the stove. Strain both lots through a fine cloth into another saucepan. To each cup of juice add three-quarters of a cup of sugar, and for each granadilla use the juice of one lemon. Place back on the stove and boil until it jellies.

Plate 68.
A mature granadilla shed carrying a good crop of fruit.

Granadilla Wine.—To make 5 gallons of wine, mash ten granadillas, fully ripe, and cover well with water in an earthenware or wooden vessel. Let it stand for forty-eight hours, then strain off. Dissolve 10 to 12 lb. sugar in hot water, and add to the juice while warm, adding sufficient more warm water to make up 5½ gallons of liquor. Pour into a cask and keep the extra half-gallon aside for filling as the fermentative process reduces the level of the wine each day. When fermentation is finished, which should be in about three weeks, 2 pints of brandy may be added and the bung driven home. The wine may be bottled off in nine to twelve months.

Grapefruit.

R. L. PREST, Instructor in Fruit Culture.

GRAPEFRUIT, the commercial or trade name given to the pomelo—*Citrus paradisi*—is credited with having arisen from the tendency of the tree to bear its fruit in clusters, and it is unlikely that it will ever be superseded by the correct horticultural term, pomelo.

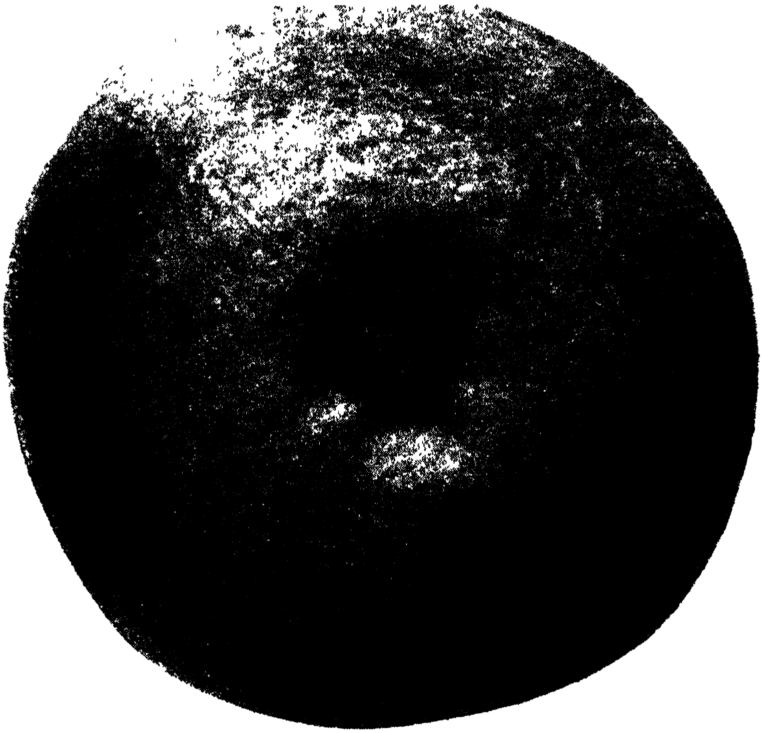

Plate 69.
Marsh Grapefruit.

The tree is a vigorous grower, handsome and symmetrical, with a rounded or conical head. The bark is of a smooth greyish-brown colour. The foliage, when mature, is a dark glossy green; whilst the young shoots and leaves are smooth and light-green in colour. The leaves are ovate, blunt, pointed or rounded, smooth and leathery, and the margin crenate, the petioles being broadly winged. The flowers are produced singly or in cymose clusters, and are sweet scented, the calyx being large and the sepals four or five in number and pointed. The corolla is white, and the petals, four or five, slightly reflexed and fleshy. There are from twenty to twenty-five stamens, the anthers being large and the pistil stout. The stigma is covered with a sticky milky fluid when ripe, and the ovaries number eleven to fourteen.

The fruit is large, oblate, globose, and may be pyriform when from out of season blossom; colour light-lemon to pale-orange; flesh greyish or pink; juice sacs large, spindle shaped and closely packed together. The flavour is a blending of bitter, sweet and acid; the seeds being large, light coloured, wedge shaped or irregular; and the cotyledons white.

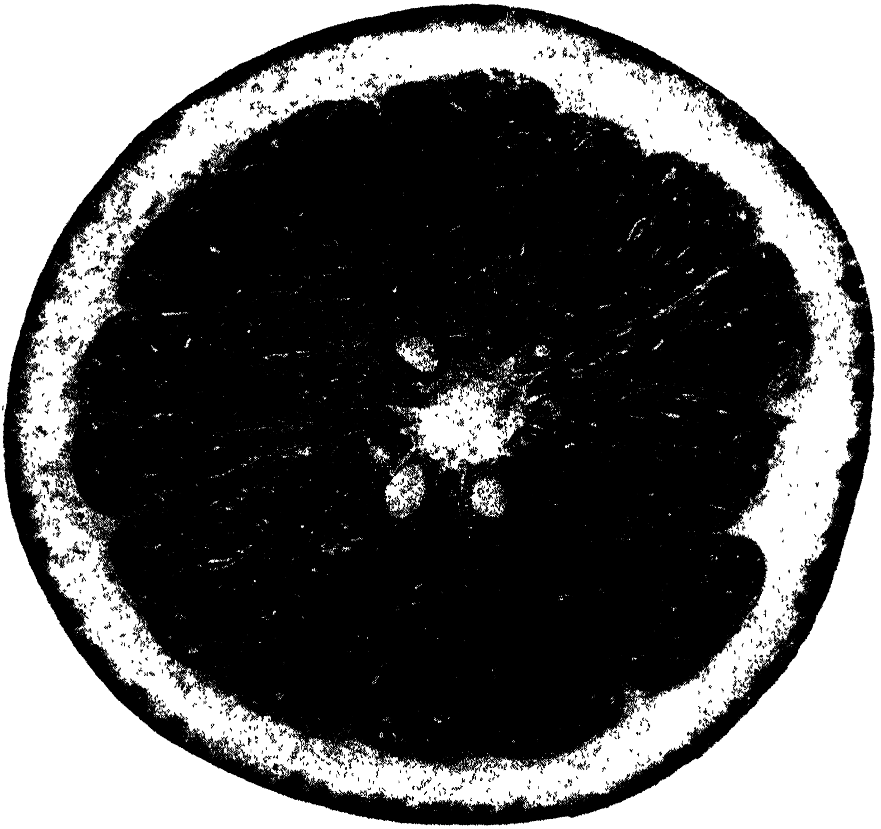

Plate 70.
Cross-section—Marsh Grapefruit.

As a breakfast fruit the pomelo, or grapefruit, is without equal, and in America it is a common and much-sought-after breakfast dish. In Australia, it is not quite so well known, though in the Southern States, and latterly in Queensland, the demand for it is steadily increasing. On the Brisbane market the popularity of this desirable breakfast fruit has been somewhat retarded by the sales of bitter-sweet and sour oranges under the name of grapefruit. This practice is being discouraged, and purchasers are advised to look for a pale-lemon colour in the fruits offered for sale as grapefruit.

Besides being an excellent appetiser, the grapefruit is credited with having tonic properties. The flavour of the ideal fruit is pleasant yet indescribable; and, as previously stated, a blend of bitter, sweet and acid. Lacking this, it falls short of its high standard and can only be classed as inferior.

The bitter principle is contained in the partitions of the fruit. Some connoisseurs contend that it would be better if this were eliminated, and consider that those varieties in which the bitterness is nearly absent are preferable. It should, however, be realised that without the bitter principle the fruit would not be a pomelo. In quality fruits the bitterness should be rather prominent.

Varieties that have done well in Queensland are:—

Marsh Seedless:—Form oblate; roundish; colour pale lemon-yellow; medium thick rind; smooth; sections thirteen; regular; juice sacs small; flesh greyish-green; flavour good, bitter principle not very pronounced; acidity and sweetness good; seeds none to six, large, plump; midseason.

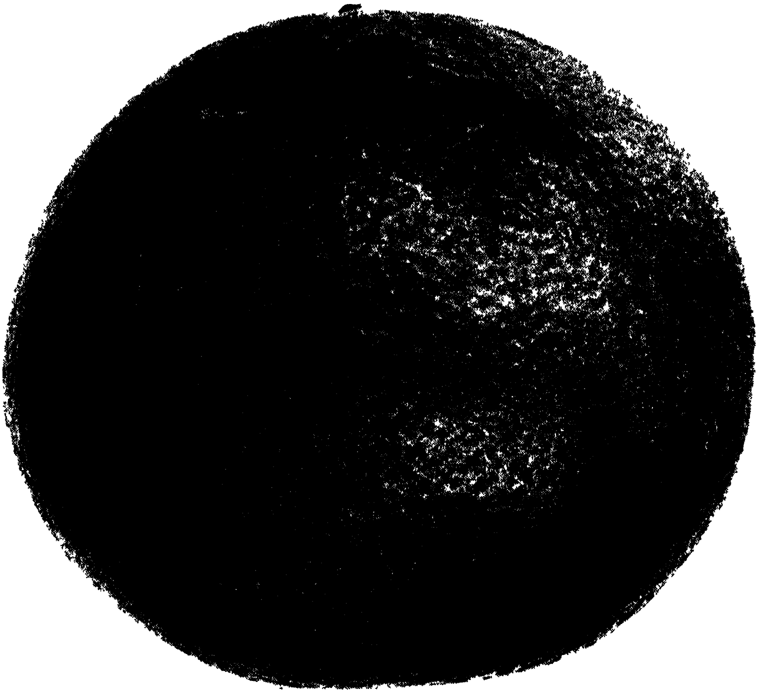

Plate 71.
Duncan Grapefruit.

Duncan:—Form oblate; colour pale lemon-yellow; rind smooth; sections fourteen; large; bitter principle well-marked; acidity and sweetness good; quality very good; seeds about 50, large, plump, blunt; midseason.

Fosters:—Form oblate; colour pale-yellow; rind smooth; sections thirteen; large; bitter principle strongly marked; acidity and sweetness good; quality very good; flesh pinkish; seeds about 60, large, plump, wedge-shaped or irregular; season early.

Triumph:—Form oblate or oblate oblong, somewhat flattened at base; colour light-yellow; rind very smooth; sections eleven; bitter principle not strongly marked; acidity and sweetness good; seeds 37; medium, plump, roundish; season medium early.

Though Marsh Seedless at present holds pride of place, chiefly on account of its having only a few seeds, the high quality of such varieties as Duncan, Foster, and Myrther, in spite of their seediness, cannot

Plate 72.

Preparing a grapefruit for table.

be denied, and they require little, or no greater, trouble to prepare for the table.

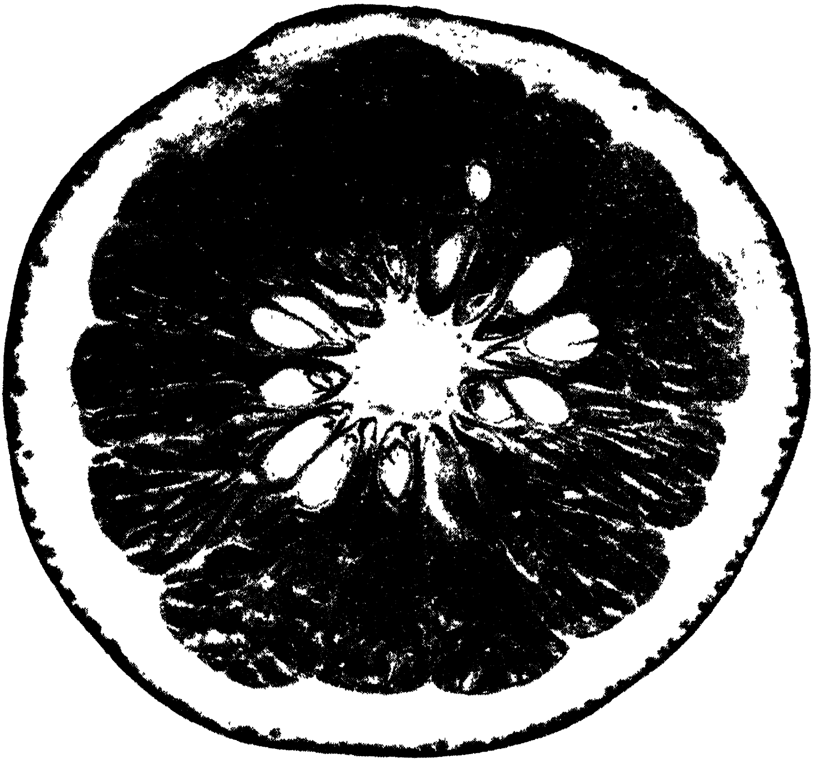

Plate 73.
Cross section—Duncan Grapefruit.

In preparing for the table, bisect the fruit transversely, using a sharp thin-bladed, slightly pointed knife. Secondly, cut round and remove the core, which operation at the same time removes practically all the seeds. Thirdly, from the centre cut outwards down through the partitions which divide the sections. Finally, cut round the partition enclosing the sections and separating the pulp from the rind. Each half of the fruit may then be lightly sprinkled with sugar to taste and placed in the ice chest overnight. Prepared in this manner, the pulp may be readily scooped out and eaten with a spoon.

TO FIREPROOF CANVAS.

The following directions are given in *Successful Farming* (Iowa) for fireproofing canvas, curtains, or similar material:—Mix 1 lb. of ammonium phosphate and 2 lb. of ammonium chloride in 6 quarts of water, and then soak in it the article it is desired to render fireproof. Lightly squeeze out the excess liquid and let the material dry with the ammonium salts in it.

For the more delicate fabrics use 10 oz. of borax and 8 oz. of boric acid dissolved in a gallon of water. Wring very lightly and allow to dry, but do not rinse the material.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

WINTER marketing conditions are still with us. The month has had, generally speaking, more dull days than usual. This on two occasions caused a sharp decline in fruit values, fortunately only of a temporary nature. The most disappointing feature of the market during the winter has been the poor prices realised for tomatoes. Much of this trouble has been caused through green and poorly matured fruit. The sooner growers realise that artificial colouring methods, to benefit the industry must be used correctly, the sooner will improved prices result. Tests have shown on every occasion the absolute necessity of harvesting none but properly matured fruit. Immature fruit will not colour satisfactorily under any process at present known.

Tests are being conducted by the Department, and progress results should be available by the time these notes are in print. Complaints of green papaws and pineapples are still being received from Southern markets. Following last month's warning the seriousness of this practice is again stressed. The following is a summary of market prices during the latter part of July:—

TROPICAL FRUITS.

Bananas.

Melbourne.—Nines and eights, 23s. to 25s.; sevens, 22s. to 23s.; sixes, 19s. to 21s. Thin, immature lines considerably lower in price, and hard of sale.

Sydney.—Nines and eights, 21s. to 25s. tropical case; sevens, 18s. to 22s.; sixes, 16s. to 19s. Inferior grades considerably lower.

Brisbane.—Nines, 19s. to 22s.; eights, 18s. to 21s. 6d.; sevens, 15s. 6d. to 20s.; sixes, 14s. to 18s. 6d.; smalls, 11s. to 15s.

Lady Fingers, 2d. to 7½d. per dozen.

Pineapples.

Sydney.—Smooths, 7s. to 10s. per case.

Melbourne.—Smooths, 8s. to 10s. Special lines at higher rates. Green fruit hard of sale. Black heart is prevalent.

Brisbane.—Smooths, 4s. 6d. to 7s. case. Loose, 1s. 6d. to 5s. per dozen. Ripleys, 3s. to 5s. case. Loose, 1s. to 3s. 6d. per dozen. Supplies are on the light side and values should be maintained.

Papaws.

Melbourne,—15s. to 18s.

Sydney.—10s. to 14s.

Brisbane.—Yarwuns, 6s. to 9s. per tropical case; Locals, 2s. to 6s. per bushel; Gunalda, 5s. 6d. to 6s.

Complaints of green fruit have been received from all markets. Growers, remember we are in the winter months of marketing!

Custard Apples.

Brisbane.—3s. to 4s. 6d.

Melbourne.—4s. to 6s.

Sydney.—4s. to 6s. 6d.

Some excellent fruit has been on the markets during the season.

Passion Fruit.

Melbourne.—4s. to 7s. per half-bushel.

Sydney.—6s. to 9s.

Brisbane.—Specials to 9s.; firsts, 6s. to 7s. 6d.; seconds, 4s. to 5s. per half bushel.

Avocadoes and Granadillas have not been seen on the market during the month, so no quotes are available.

CITRUS FRUITS.

Mandarins have risen to high levels during the month. Good quality fruit will continue to sell at ruling rates. Oranges had some setbacks due to the dull, wet weather, but as the month closes prices are steady again. Lemons, whilst not returning high values, have remained at a payable level for good lines.

Oranges.

Brisbane.—Navels, 8s. to 10s.; commons, 5s. to 8s.

Sydney.—Navels, 5s. to 9s.; commons, 4s. to 7s.

Melbourne.—Navels, 5s. to 11s.; commons, 3s. to 5s.

Mandarins.

Melbourne.— 5s. to 11s.

Sydney.—4s. to 8s.

Brisbane.—Glens, 6s. to 13s.; Special Gayndah, 1s. higher; Emperor, 6s. to 12s.; Scarlet, 5s. to 11s.; Fewtrells, 7s. to 9s.

Grapefruit.

Melbourne.—4s. to 10s.

Sydney.—5s. to 10s.

Brisbane.—5s. to 8s.

Lemons.

Melbourne.—4s. to 9s.

Sydney.—5s. to 8s.

Brisbane.—Gayndah, 6s. to 10s.; locals, 5s. to 7s.; Victorian, 4s. to 7s.

Strawberries.

The dry season has reduced supplies of early berries, but the rains during the last few weeks have caused an increase.

Sydney.—Trays, 3s. to 5s.; boxes, 7s. to 10s. per dozen.

Brisbane.—6s. to 8s. per dozen boxes: choice quality, 9s. to 12s. per dozen boxes.

DECIDUOUS FRUITS.

Apples.

Brisbane Prices.—Jonathan, 6s. to 9s.; Granny Smith, 5s. to 9s., with specials to 10s. per bushel; Sturmer, 5s. to 6s. 6d.; French Crab, 5s. to 6s. 6d.; Democrats, 6s. to 7s.; Rome Beauty, 6s. to 8s.

From now to the end of the season Southern growers should take care to send only carefully selected lines of the larger-sized fruit. Fruit may appear in good condition when it is removed from storage in the South, carry well, and arrive safely on the Brisbane market. The difficulties arise when the Queensland higher temperatures with high humidities are encountered. Again, it must not be forgotten that the country order trade pays the best prices. Fruit bought for this trade often has to travel hundreds of miles before reaching its distributing centre. Growers need have no difficulties if close attention is paid to varieties and sizes. After August only hard, good-carrying types should be sent to Queensland. Rome Beauty, Statesman, Sturmer, and large-sized Jonathan are risky types of fruit to send.

Pears.

Winter Coles, 8s. to 14s.; Josephine, 9s. to 13s.; Broom Park, 6s. to 8s.; Parkhams, 6s. to 9s. The necessity of wrapping all lines of pears is pointed out. Unwrapped lines soon become specky.

OTHER FRUITS AND VEGETABLES.

Cape Gooseberries.

Brisbane.—6d. to 7d. per lb.

Tomatoes.

Brisbane.—Green, 1s. 6d. to 3s.; ripe, 1s. to 2s. 6d ; coloured, 2s. to 4s.

Poor attempts at artificial colouring are the main cause of price discrepancies. Good, full, healthy-looking coloured fruit still maintains the high values. This can only be achieved by using matured fruit for colouring purposes.

Sydney.—2s. 6d. to 4s.; specials, coloured, 5s.

Melbourne.—Queensland, 4s. to 6s.; Western Australian, 7s. to 10s.

Cucumbers.

Sydney.—7s. to 10s. bushel case.

Lettuce.

Brisbane.—1s. to 1s. 6d. per dozen.

Beans.

Brisbane.—9s. to 12s. per bag.

Peas.

Brisbane.—4s. to 6s. per bag.

Pumpkins.

Brisbane.—4s. to 5s. per bag.

Publications.

Booklets on strawberry packing and banana packing are now available on application to the Under Secretary, Department of Agriculture and Stock.

In Memoriam.

WILLIAM REDPATH BENNETT.

Plate 74.

WIDESPREAD regret was felt among his colleagues of the Department of Agriculture and Stock, as well as among large sections of the general public, at the news of the death of Mr. William Redpath Bennett on 30th June.

Mr. Bennett was born at Gateshead-on-Tyne, England, on 3rd May, 1883, and arrived in Queensland in February, 1913. He was appointed an inspector under the Diseases in Plants Act, administered by the Department of Agriculture and Stock, on 1st August, 1916, and, for the greater part of his time in subsequent years, was engaged as a fruit inspector. Although handicapped by deafness, Mr. Bennett at all times was a courteous and capable officer, and his kindly nature gained him the respect and regard of all with whom he came into contact either officially or in his private capacity.

Mr. Bennett's mortal remains were laid to rest at the Lutwyche cemetery on 1st July, after a church service at Windsor, which was attended by the Minister for Agriculture and Stock (the Hon. Frank W. Bulcock), the Under Secretary for Agriculture and the Director of Marketing (Mr. E. Graham), and a representative gathering of officers of the department, fruit merchants, and many others.

To his sorrowing widow and other relatives, deepest sympathy is extended.

Lime-spreading Machinery.*

H. W. KERR.

IT is now well-recognised that most of the alluvial soils of North Queensland, as well as certain areas of other classes of soils in these parts, are in need of regular lime applications to destroy the acidity which develops under conditions of high rainfall, and which acts detrimentally to the growth of the cane crop.

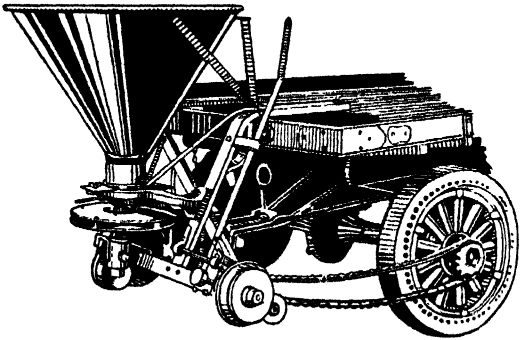

Plate 75.
Broadcaster Mounted on Motor Truck.

With the realisation of this need, attention has also been given to means by which lime may be spread speedily, evenly, and cheaply. This is particularly the case where the use of burnt lime is desired. This material is very disagreeable to handle, owing to its caustic nature, and the double handling which is necessary, where it is dumped in small heaps to slake before spreading, adds to the costs of application. Now that pulverised burnt lime is readily available, the use of a lime spreader becomes possible with any of the several forms of lime.

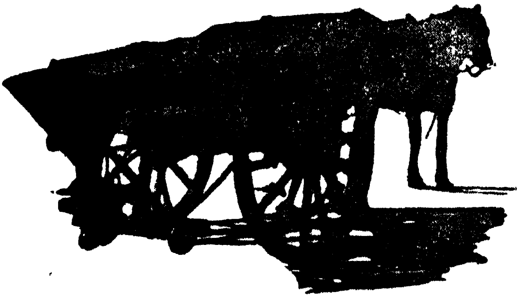

Plate 76.
Broadcaster Mounted on Dray.

The usual form of spreader employed by certain northern growers is the well-known hopper mounted on wheels, and by means of the mechanism which it contains the lime is delivered through small feed drills set in the bottom of the hopper. The amount delivered can usually be adjusted over a fairly wide range.

Another type of lime-spreader, which can be accommodated for use with standard farm vehicles, might appeal to those growers who do not

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*From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

feel disposed to purchase a more expensive unit which can be employed for lime spreading only. Several forms of this Australian-made equipment are shown in the accompanying illustrations (plates 73-76). The essentials of the unit may be attached quickly to a dray, wagon, or motor truck. The dumping of the lime on the headland and its transfer to the lime-spreader are thus avoided, as the lime may be spread directly from the vehicle which transports the material from the railway truck.

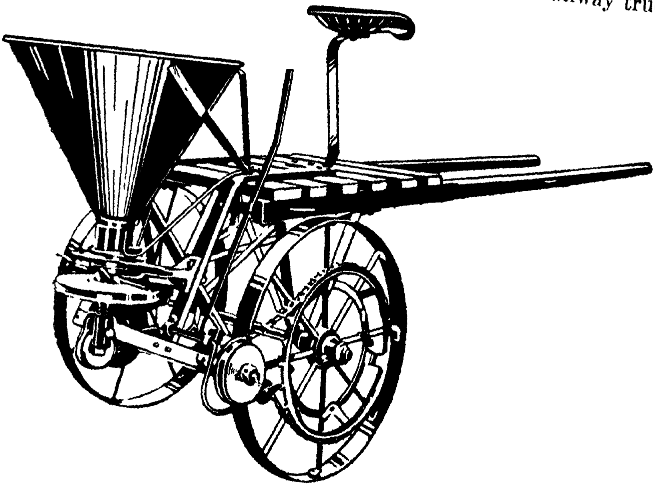

Plate 77.
Broadcaster Mounted on Steel Wheel Sulky.

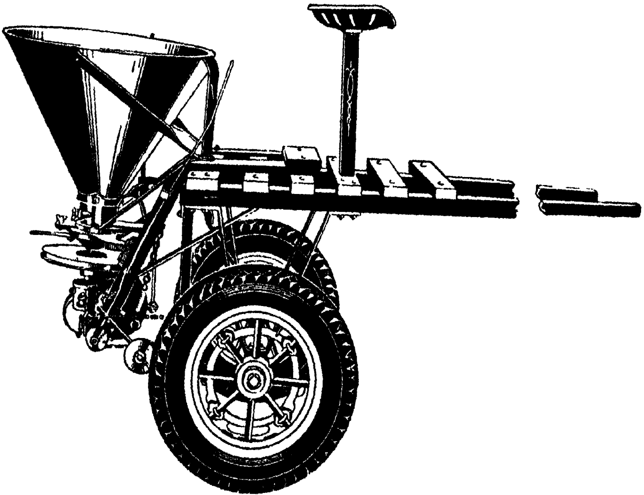

Plate 78.
Broadcaster Mounted on Sulky with Pneumatic Tyres.

It is claimed by the manufacturers that the spreader is of robust construction, and the lime may be spread over a strip 18 to 20 feet wide.

This obviates the necessity for driving close to fences or other obstructions. The range of application varies from less than a hundredweight (when broadcasting superphosphate for example) to a ton or more where this is desired. Areas of up to 250 acres per day have been covered, with a motor lorry attachment, when pastures were top-dressed with superphosphate. The correct size of chain and sprocket is supplied, in these circumstances, for the particular make of truck being used. It is stated that the gears are totally enclosed in an oil bath, so as to eliminate wear from dust and grit. The one serious objection to this type of broadcaster might be the difficulty of spreading very fine lime in windy weather. However, the spreading of normal crushed lime should not present this difficulty, and for fine powdery material the work would be confined to the early morning hours.

The approximate weight of the attachment for wagon, dray, or truck is 3 cwt., while the complete unit on wheels—either steel or pneumatic tyres—is 6 cwt.

Any grower desirous of obtaining further details regarding these machines should communicate with the Director, Bureau of Sugar Experiment Stations, Brisbane, who will put him in touch with the manufacturers.

IN THE CITRUS ORCHARD.

Abnormally dry seasonal conditions have not only resulted in light crops, but have affected tree growth adversely Every endeavour therefore should be made to effect an early cleaning up of orchards and to afford the trees an opportunity to put out healthy, vigorous growth and blossom in the spring.

In the younger orchards, where well-developed frameworks have been maintained, the usual pruning, such as the removal of suckers and decadent first-fruiting shoots, should be carried out.

In the older orchards, the lack of vigorous healthy fruiting wood has become more pronounced. This condition points to the necessity for a rather severe thinning out, and, at the same time, a shortening back of terminal growth and twigs. The cuts should be made right back to strong growths; weak shoots and those that have borne fruit should be removed. The thinning leaves spaces for subdivision, while the shortening back tends to force into growth dormant buds from behind. At the same time, it stops an excessive growth of branches and renews supplies of fruiting wood. In cases in which crowding is evident, the removal of entire branches is desirable. The entry of plenty of light and air assists the growth of healthy and vigorous shoots which make new fruiting wood. Any excessive growth of suckers or water shoots arising well inside the tree as a result of heavy pruning needs to be cut away, or it will crowd the centre of the tree.

In older trees, where vitality has been impaired, provision will need to be made for the removal of old, crowded, and decadent limbs. In such instances the pruning is much heavier than usual, necessitating the removal of entire branches. Such branches should be cut right back to their source of origin, so that the sap will be readily diverted to the remaining limbs and encourage the formation of new fruiting wood. Under no circumstances whatever should stubbing be resorted to. In instances where it is necessary to replace larger limbs, the work should be done gradually over two or more years in order to avoid excessive suckering.

Lower branches of trees should not be allowed to touch the ground, as fruit borne on such branches is generally blemished and of poor quality. On the other hand, trees should not be pruned too high from the ground. The height to which they should be lifted varies according to circumstances, but in most instances knee-height will be satisfactory.

R. L. Prest.

Rat Investigation.*

W. A. McDOUGALL.

AT this conference last year a progress report on rat investigations was presented. Actually that report, compiled after a short time in the field and on the advice and writings of men eminent and experienced in this line of work, set out in a general way the proposed method of attacking our rat problem. During the past year no good reasons have come to our notice (either from the results of the work of others or from our own experiments) which warrant materially altering the original programme. It has been persevered with and advanced as far as possible under somewhat adverse conditions. References to the chief of these conditions, i.e., the abatement of the epidemic of 1934-35, will be made here and there in this report and they will partially cover several of the points mentioned or inferred in last year's report.

During June-September last year a brief survey of mill areas north of Townsville (Mourilyan and Goondi partially excepted), the Burdekin, and the Central Districts, showed the house rat, the field rat, and the khaki, tree, or "Melomys" rat to be present in all of them. However, all these mill areas with one exception (the Central Districts), and irrespective of whether systematic or sporadic poisoning campaigns had been carried out, suffered comparatively light rat damage last year. In these circumstances it is not possible to state definitely the rat or rats responsible for the severe damage during past epidemics in all the districts mentioned above, but field observations and cage experiments indicate that the field rat is by far the most important. So far this rat, without variations, has been found to exist only along the coast from Mackay to some miles north of Mossman. Within this area its full distribution is not known. Past damage to cane tends to connect it, at least superficially, with coastal rivers and creeks. It is also present in the higher and well-grassed portions of marine swamps, and in some districts it damages cane high up on hill sides and against "scrub." In some districts against scrub is the chief locality of damage. So far as is known the common scrub rat of the coastal districts (*Rattus assimilis* and its varieties which extend throughout Eastern Australia) does not eat cane and the field rat does not enter scrub. To date most of the heavy damage in cane against scrub in the Central Districts shows both the field and khaki rats to be present. The khaki rat has a comparatively wide distribution, and the conditions under which it exists vary considerably.

In the furtherance of the subject of rat distribution and as an indication of the lines along which our efforts at control are directed there is a fundamental idea which could be expressed at this juncture. This idea or fact is very well put in the writings of a man who is probably one of the most eminent and experienced authorities on ecology and rodent plagues, as follows†:—

> "it is a familiar fact that serious plagues of mice, rats, and other rodents occur from time to time in various parts of the world, often causing a great deal of damage. Readers of Mr. Elton's book will discover that these violent outbreaks are but special cases of a regular phenomenon of periodicity in numbers

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* Address to the Pests Boards Conference, held at Meringa, 13th May, 1937, and reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

† From the Editor's Introduction by Julian S. Huxley to "Animal Ecology" by Charles Elton, 1935.

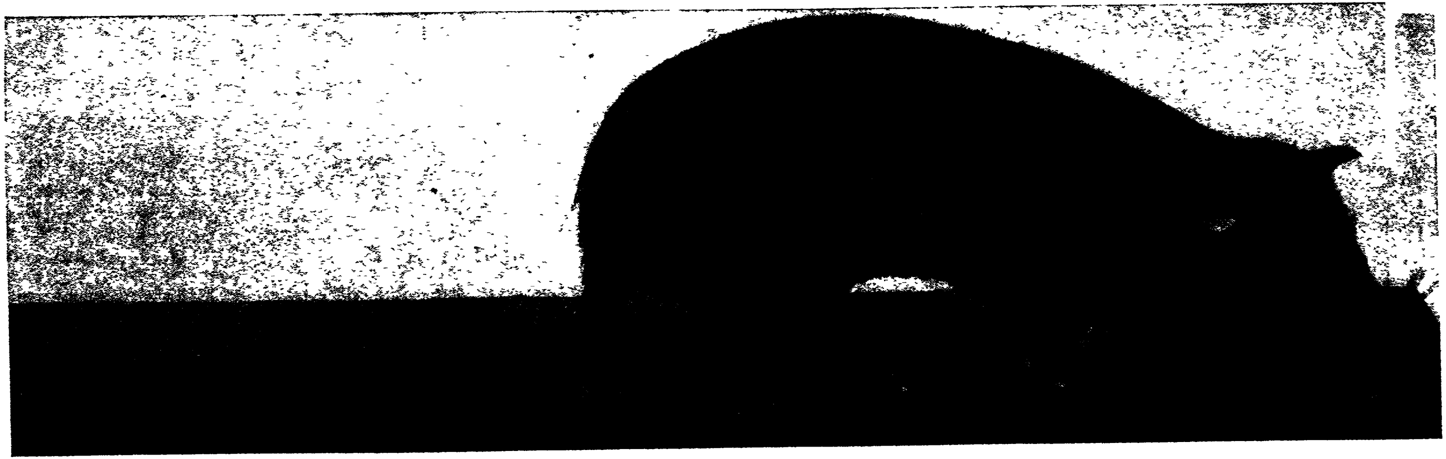
> which is perfectly normal for many of the smaller mammals. The animals favoured by climatic conditions embark on reproduction above the mean, outrun the constable of their enemies, become extremely abundant, are attacked by an epidemic, and suddenly become reduced again to numbers far below the mean. When such a number-maximum is so accentuated as to become a plague remedial measures are called for locally, and large sums of money may be spent. Eventually the normal epidemic breaks out and the plague abates. The organisers of the anti-rodent campaign claim the disappearance of the pest as a victory for their methods. In reality, however, it appears that this disappearance is always due to natural causes, namely, the outbreak of some epidemic; and the killing of the animals by man has either had no effect upon the natural course of events, or has delayed the crisis with the inevitable effect of maintaining the plague for a longer period than would otherwise have been the case. In the latter event, it would actually have been a better counter measure to do nothing at all than to spend time and money in fruitless killing. If remedial measures are to be desired, they should be of some special sort. Either they must encourage the development of the epidemic, as by introducing infection amongst the wild population of the pest species; or they may aim at reducing reproduction . . . . ; or they must be aimed at the general ecological status of the species, making it more difficult for it to live and reproduce . . . .''

It cannot be expected, nor would it be wise, if those of us who have to conduct campaigns with the often tried and varied conventional methods at our command were convinced of the truth of the above inference, that the methods should be dropped and nothing done. On the other hand, it should not be expected that a research officer will dodge an unpleasant and unpopular fact and go along the well-beaten track thereby deluding himself and others, when there may be possibilities in other directions. This more or less explains our interest in rat distribution, rat behaviour, populations, and breeding under different conditions. During the past year some preliminary work on these subjects has been done. None of it, as yet, is conclusive. Also it is too early to report on the sick rats (and dead ones found above ground) which have been taken in the Central District (no baits present) since October last.

Whilst always bearing in mind that plague conditions and light sporadic infestations might well be treated separately, some poison experiments have been carried out, some attempts at population estimates have been made, and a preliminary investigation of deterrent sprays has been commenced. The results of all these experiments were unsatisfactory—in fact they may be placed, with a large percentage of all rodent work, under the heading of experience and not scientific experimentation.

For the possible use of field men the minimum lethal doses of all the common oral rat poisons, combinations of them and some others should be completed by the end of this year.

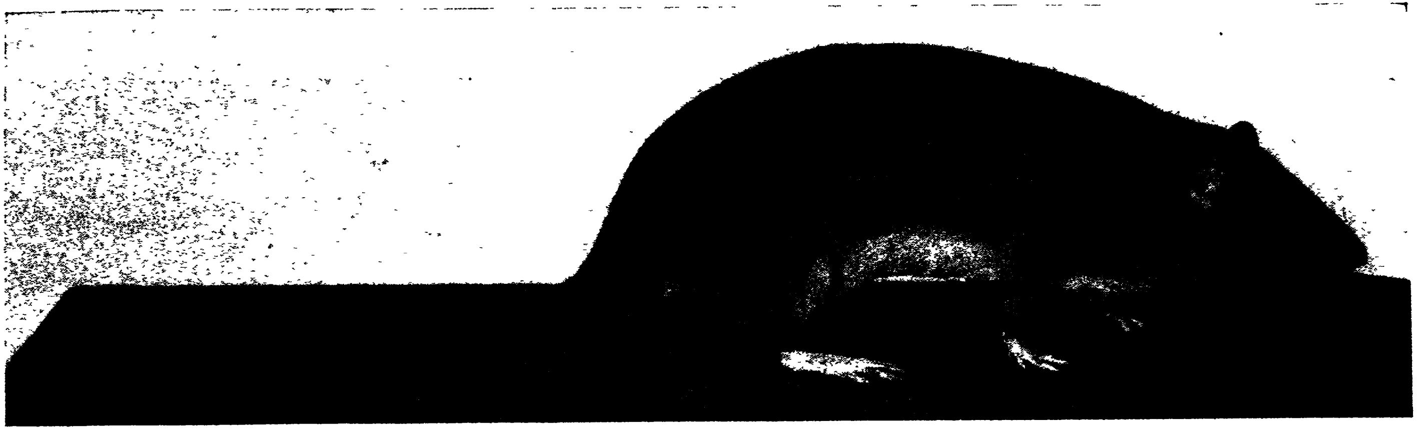
As this report has been written primarily for the purpose of opening discussion on the subject of rat control no detail has been given and it may be concluded with paragraphs on varieties and rat control work being done in other countries.



a. Rattus culmorum or the Field Rat (¾ natural size).

b. Melomys littoralis or the Khaki Rat (⅘ natural size).

a. Rattus rattus or the House Rat (½ natural size).



b. Rattus norvegicus, the Brown or Sewer Rat (½ natural size).

Plate 80.—The House rat and the Ship rat are chiefly responsible for damage around stables and farm houses and in towns. **The House rat occasionally damages cane but is not a serious pest in the canefields. The Brown rat, although present in some sugar towns, has not been found in Queensland canefields.**

It has been found that any variety of cane may, at times, be severely damaged by rats. The extent of damage depends, amongst other factors, upon rat population, the conditions under which the rats are present in the cane, and the ability of the variety to stand up to rat attack. For example: in rat country in Central Queensland P.O.J. 213 is a badly-damaged variety. It provides excellent cover, its thin barrel will not stand up to many "feeds," and it is soft. Badila, Co. 290, P.O.J. 2725, and Clark's Seedling all provide rat food which is readily accepted by the pests. Fields of P.O.J. 2714 and E.K. 28 where misses were planted up with Clark's Seedling have been inspected. Nearly every such stool was found to be badly rat eaten whilst the others were left alone. Farms where flooding is not experienced and where fields of Badila and P.O.J. 2878 are grown have shown the former to be severely rat damaged and the latter to be comparatively free of bites. On the other hand, P.O.J. 2714, E.K. 28, and P.O.J. 2878, grown on the higher patches of marine swamp, have suffered severe damage Standover crops of these varieties are often attacked by rats, as are D. 1135 and Uba either as ratoons, plant, or standover cane.

As may be known to many of us, at the present time an extensive rat control research programme is under way in the Hawaiian Islands. No doubt in the near future, particularly if another plague soon comes along, we in this country may hear more of hambergers, and rolled oats, &c., as bases for baits. An attempt is also to be made there to learn something of the life history, &c., of the rat with which they are dealing. A comparison of this work with our own along similar lines should be interesting and useful. In several other countries attempted control of the house rat by new materials is in progress. Although not applicable to our field conditions the use of fumigation by "smoke" in parts of India could be noted.

PREPARING LAND FOR SPRING PLANTING OF PINEAPPLES.

The early preparation of land for the spring planting of pineapples is desirable, and areas to be planted should be ploughed now, as deeply as the implements available and the depth of the surface soil will permit. If possible, this ploughing should be followed by at least one subsoiling to a depth of 18 inches. On no account should the subsoil be brought to the surface. The land should be left in the rough for some time, and, later, ploughed and cultivated to a good even tilth. It will then be in good condition for planting at a favourable opportunity in the spring. It should be borne in mind that a stand of pineapples remains in the ground for several years, and consequently deep cultivation must be carried out prior to planting.

Adequate preparation, as suggested, improves both the aeration and moisture-holding capacity of the soil and thus enables root growth to take place under the most favourable conditions. This is most important, since the first few months of the life of a pineapple plantation largely determine its productivity. Furthermore, as has been demonstrated convincingly, vigorously growing plants are highly resistant to disease.

W. G. Hancock.

Branding and Earmarking of Stock.

H. S. ILIFF, Deputy Registrar of Brands.

THE following particulars regarding the branding of stock and the earmarking of cattle and sheep may be of interest to stockowners who are not clear as to the requirements of the Brands Acts and Regulations:—

The branding or earmarking of stock is not compulsory in Queensland; but, if either is used, only brands and earmarks registered under the Brands Acts will be permitted.

Registered brands or earmarks are not necessary in the case of tattoo brands, pig brands, paint brands on cattle or horses (for temporary identification purposes), age numerals, or stud and herd book numbers imprinted below a registered brand at the first branding.

A brand may be used without an earmark, but an earmark may be used only on cattle carrying the owner's brand with which the earmark is registered.

In earmarking, the marks must be made on the portions of the ear or ears indicated in the registration certificate. The use of a knife for earmarking is illegal.

BRANDING.

Horse and cattle brands may be used in any part of Queensland, but earmarks are issued for use in specified districts and may be used only in the district for which the earmark is registered. Only the full brand can be used, and the owner may imprint the first brand on his cattle upon any one of the following positions:—

First position—neck.

Second position—rump, hip, or thigh.

Third position—ribs.

Fourth position—shoulder or top of arm.

The first brand on a horse may be put on any one of the following positions:—

First position—"near shoulder."

Second position—"off shoulder."

Third position—"near quarter" or "near thigh."

Fourth position—"off quarter" or "off thigh."

Fifth position—"near ribs."

Sixth position—"off ribs."

(The "off" side is the right-hand side and the "near" side is the left-hand side in all stock.)

The owner of a symbol horse and cattle brand may use the symbol brand either in addition to or instead of the three-piece brand with which the symbol is registered.

In the case of first brandings, the symbol brand may be imprinted upon either cheek of stock, but any second or subsequent branding must, if there is sufficient space, be placed at a distance of not less than 1½ inches nor more than 2½ inches from, and directly underneath, the previous brand imprinted on the stock. If there is insufficient space underneath the previous brand, rebranding must be done on the next position. If, for instance, the previous brand is on the fourth position in the case of cattle, or on the sixth position in the case of horses, and there is not sufficient room for a new brand on those positions, the rebranding must be done on the first position—the neck in the case of cattle, and the near shoulder in the case of horses.

It is important to note that when a second or any subsequent brand is imprinted on cattle, it must be placed on the same side of the beast as the immediately preceding brand. The branding of cattle is thus confined to one side.

(Symbol brand owners may have a special position allotted upon which to rebrand purchased horses and cattle.)

The penalty for a breach of these rules of branding is £50.

In the case of first brandings, an owner is entitled to select any one of the positions here specified.

The size of branding irons is restricted to not less than 1¼ inches in length or more than 3½ inches in length for horses and cattle.

Fully grown stock may be branded with a brand not less than 1¼ inches in length or more than 5 inches in length.

EARMARKING.

It is illegal to earmark cattle which have been previously earmarked, or to put any unregistered mark or cut of any kind upon the ears of cattle.

Purchased stock with two full ears may be earmarked provided they are first rebranded with the owner's brand with which the earmark is registered.

Earmarking for distinctive purposes, such as to denote speying, inoculation, &c., is illegal.

The dewlap mark may be used for any distinctive purpose, but it is not registered or recognised by the Department.

Distinctive brands, for use on the cheek of cattle or horses, may be registered without fee, to denote age, class, inoculation, speying, &c. These cheek brands may be used only on stock bearing the owner's registered three-piece brand.

The breeder or first brander may imprint numerals under his registered brand for stud or herd book reference or to denote the age of his horses or cattle.

The removal of more than one-third of the ear of any stock in earmarking is illegal.

SHEEP BRANDS AND MARKS.

Sheep earmarks may be used without a sheep paint brand or fire brand, or *vice versa*. All registered sheep earmarks must be made on the "near ear" of female sheep, goats, or swine, and on the "off ear" of male animals.

When sheep have been earmarked with a registered mark, it is illegal to earmark them again on the "registered ear." Distinctive marks to denote the age, class, &c., must be imprinted on the "off ear" of female animals and on the "near ear" of males.

These marks are not registered, but no distinctive marks may be used which are similar to any registered earmark used in the same locality.

Earmarks, paint brands, and fire brands must be used on the positions for which they are registered and as shown on the certificate of registration.

As in the case of cattle earmarks, the use of a knife for earmarking sheep is illegal, and pliers must be used. There are no exceptions to this rule.

In the event of the death of the owner of any brand or earmark, it is necessary to have a transfer of the brand or mark into the name of the person who wishes to make use of them. All owners of brands or earmarks should notify the Department of any change of address.

The alteration of address is published in the next issue of the *Government Gazette*, and is a protection to the owner in the event of any of his stock straying or being impounded.

The fees for the registration and transfer of brands and earmarks are as follows:—

	£	s.	d.
Registration of a horse and cattle brand	1	0	0
Registration of a horse and cattle symbol brand	7	10	0
Re-registration of a cancelled horse and cattle brand	3	0	0
Registration of a cattle earmark	1	0	0
Transfer of a horse and cattle brand		10	0
SHEEP BRANDS AND MARKS.			
Registration of a sheep paint or fire brand		5	0
Registration of a sheep symbol brand	3	0	0
Registration of a sheep earmark		10	0
Transfer of a sheep brand and earmark		5	0

SEED POTATO SELECTION.

The problem of obtaining suitable seed potatoes for the early crop confronts most growers every year. This seed must necessarily come from southern sources, and, although the regulations demand that the bags must clearly bear the name of the variety, attention is called to the risk of buying seed of inferior quality. On most farms, it is a common practice to grade out all undersized tubers and sell them as seed. This means that the weakest and least prolific strains of the variety are included and the risk of a poor return is obvious. Much can be said in favour of purchasing larger potatoes and cutting them into sets, as this largely eliminates the danger of rubbish being planted.

It is false economy to cut the sets too small, as they serve as a reserve food supply for the plant during the early stages of its growth. Small sets soon become exhausted and the growing plant fails to receive the necessary assistance. This check hinders normal growth and handicaps the plants in the formation of tubers. Sets should not be allowed to dry out more than can be helped before planting.

For the late crop, round seed is recommended and most growers manage to reserve their own requirements. The practice of selecting this seed at the time of harvesting from the most prolific plants is well worth the extra trouble.

A. F. Skinner.

The Present Situation Regarding the Giant American Toad in Queensland.*

R. W. MUNGOMERY.

DELEGATES will no doubt remember that during the last conference we were labouring under a ban, imposed by the Federal Government, which restricted the distribution of toads to the Cairns, Gordonvale, Innisfail, and Tully districts. While this ban gave us the opportunity to stock up those districts in great detail, it affected rather harshly those districts where grub damage was not sufficiently widespread and serious to warrant the first toad liberations being made there, but where, nevertheless, grubs were serious in localised areas. Growers in these areas subsequently found themselves in the position of desiring a liberation of toads, while it was impossible to liberate any in their areas by virtue of the existence of this ban.

Accordingly we took this matter up further with the Federal Health Department who are responsible for the administration of the quarantine laws. After analysing the excreta of toads collected in this district under a variety of conditions, and dissecting a number of toads caught similarly, we presented to the Health Department the details of what they had eaten, with the result that the ban was finally lifted in September of last year. Since then toads have been liberated in the Mossman, Babinda, Ingham, Bambaroo, Giru, Ayr, Mackay, Bundaberg, and Isis districts.

It is pleasing to note that the first Australian-bred generation have commenced breeding, and toadlets are now plentiful in areas where the toads were originally liberated. Egg strings can occasionally be found in the pools along the Little Mulgrave, whilst the same pools harbour thousands of tadpoles. Breeding has been taking place there continuously since last December. Records of breeding have come from other places in the Mulgrave, Hambledon, and Innisfail districts, and toad populations in these places will soon take a sudden rise. We have, therefore, discontinued liberations in these districts ever since toads from the first liberations became mature, as any further liberations at this juncture would not add appreciably to the already existing populations there. We plan to continue extensive liberations in the central and southern districts for some time, so that having once established big populations in those areas there should be no need to make further liberations there next year.

With regard to the usefulness of toads against the Greyback beetle pest, it is much too early to judge their efficacy yet. Certainly they could have had very little or no influence on the beetle pest last year because during the flighting period the number of mature toads at large which would be capable of eating a Greyback beetle would then be too small. However, it is possible that during the coming year, in localised areas, we may gain some idea of their possible effects. I refer particularly to the Little Mulgrave area where toad populations are now dense, and grubs are now commencing to reassert themselves, and where if no serious check occurs beetle emergence is likely to be intensified at the end of this present year.

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* Presented to the Pests Boards Conference held at Meringa, 13th May, 1937, and reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

The Treatment of Horses for Worms.

AT a recent mass meeting of canegrowers held in Nambour, a very interesting address was delivered by Dr. F. H. S. Roberts on the treatment of common ailments of the farm horse. At the request of Mr. W. Kittle, Secretary of the Moreton District Canegrowers' Executive, the following notes were prepared by Dr. Roberts, for the guidance of canegrowers generally:—

Tapeworms.—Starve for 24 hours, then give 2 fluid oz. of turpentine and 1 dram male fern extract in 2 pints of raw linseed oil. Food and water may be given 4 hours after treatment. These dosages are for an animal weighing 1,000 lb. or more and should be reduced for lighter animals.

Stomach Worms.—Starve for 24 hours, then give 2 quarts of a 2 per cent. solution of sodium bicarbonate (baking soda). Thirty minutes after giving this solution, give carbon bisulphide at the rate of 2½ cubic centimetres for every 100 lb. of weight. Food and water may be allowed 4 hours after treatment. The carbon bisulphide is given enclosed in a gelatine capsule as a ball.

Bots and Large Roundworm.—Starve for 24 hours before and for 4 hours after treatment. Give carbon bisulphide at the rate of 2½ cubic centimetres for every 100 lb. of weight in a capsule as a ball. For the large roundworm, the horse may receive, instead of carbon bisulphide, oil of turpentine at the rate of 5½ cubic centimetres for every 100 lb. of weight. The turpentine is mixed with raw linseed oil (1-2 pints according to weight) and given by means of a bottle.

Strongyles or Palisade Worms.—If possible, starve up to 36 hours before and for 4 hours after treatment. Give oil of chenopodium mixed with raw linseed oil. The chenopodium is given at the rate of 1½ cubic centimetres for every 100 lb. of weight. Make sure the linseed oil moves the bowels; if not, give more oil. The chenopodium and linseed oil may be mixed and given with a bottle.

Pin Worms.—Wash out the rectum with an enema of 1-2 gallons of lukewarm water containing 2-4 oz. of sodium bicarbonate. Starve for 36 hours and then give oil of chenopodium as for Palisade Worms.

—*The Cane Growers' Quarterly Bulletin.*

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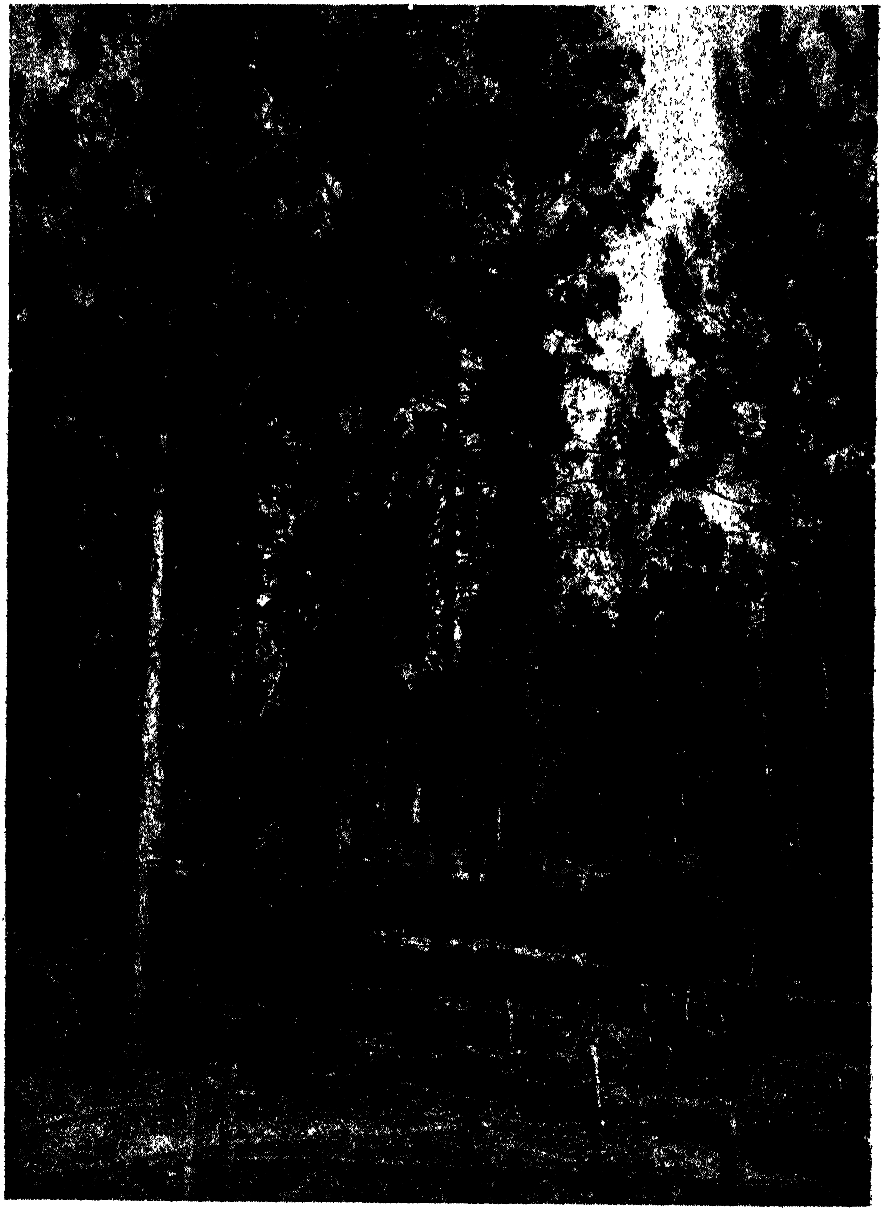
PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Jersey Cattle Society, production charts for which were compiled during the month of June, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter. Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS			
	MATURE (OVER 5 YEARS), STANDARD 350 LB.			
Model 3rd of Alfa Vale	W. H. Thompson, Nanango	15,782·05	684·399	Reward of Fairfield
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
College Gold II.	Queensland Agricultural High School and College, Lawes	11,104·45	466·506	Premier of Hillview
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
College Stately 4th (365 days)	Queensland Agricultural High School and College, Lawes	12,451·54	493·915	College Robin
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Laguna Fussy	F. G Lamkin, Moola, Dalby	6,964·3	294·598	Morden Marcus
Trevor Hill Twinkle	Geo. Gwynne, Umbiram	7,274·31	263·104	North Glen Emblem
Trevor Hill Nectar	Geo. Gwynne, Umbiram	6,754·44	254·545	North Glen Emblem
	JERSEY.			
	MATURE (OVER 5 YEARS), STANDARD 350 LB.			
Trecarne Rosella 4th	T. A. Petherick, Lockyer	7,410·27	353·362	Trinity Officer
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Glenmore Bluebell	L. J Comiskey, Warra	5,212·51	289·131	Glenmoore Jolly Jester
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Kathleigh Glory	J Goostrey, Landsborough	6,037·45	314·749	Retford Royal Atavist
Maurfield Larkspur's Dewdrop	F. Maurer, Darra	4,993·55	280·648	Prospect Monto
Lorine of Calton	D. R. Hutton, Bellgarth, Cunningham	5,235	270·952	Retfords Glory King II.

Forestry in Queensland.



[*Photo: J. A. Lunn, Survey Office.*

Plate 81.

A THINNED-OUT CYPRESS PINE STAND NEAR BARAKULA.—Natural regeneration and thinning operations by the Field Staff of the Queensland Forest Service have greatly increased the growth and improved the stand in our hardwood and cypress pine forests.

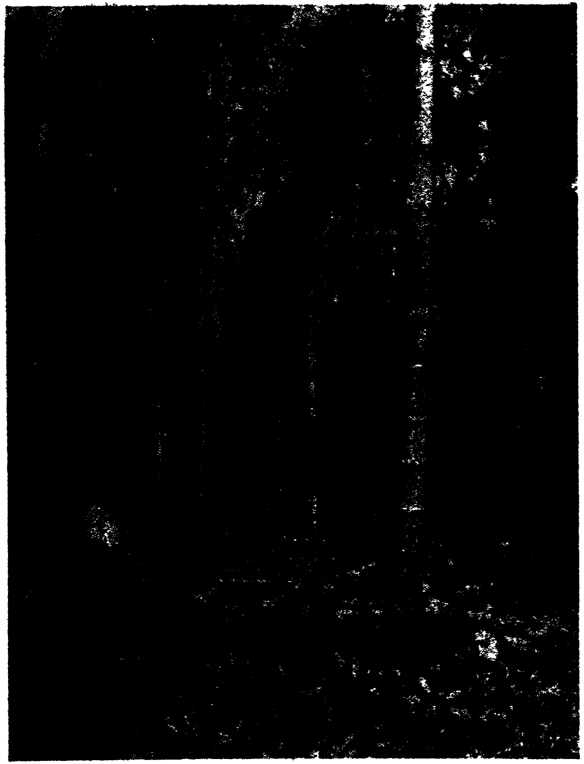
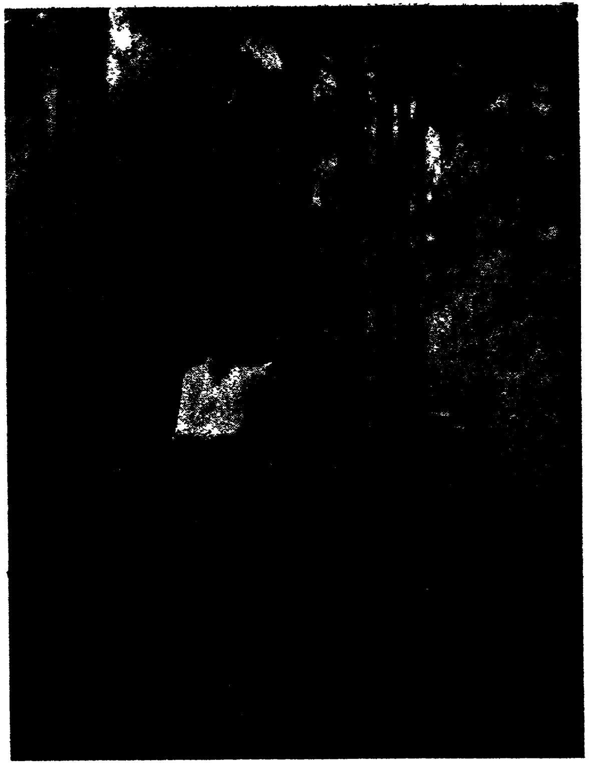


Plate 82.

A Twenty-year-old Stand of Kauri Pine at Barron, North Queensland.



[Photos: *Queensland Forest Service.*

Plate 83.

Slash Pine Plantation at Barron.

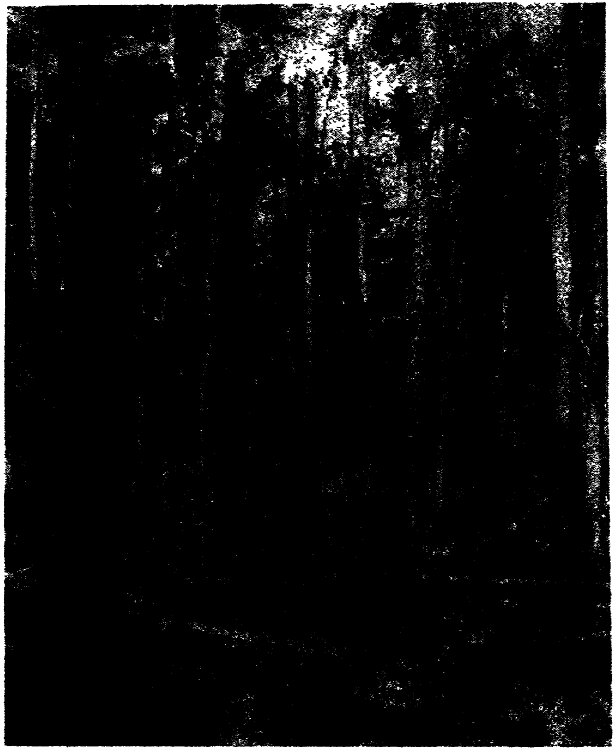
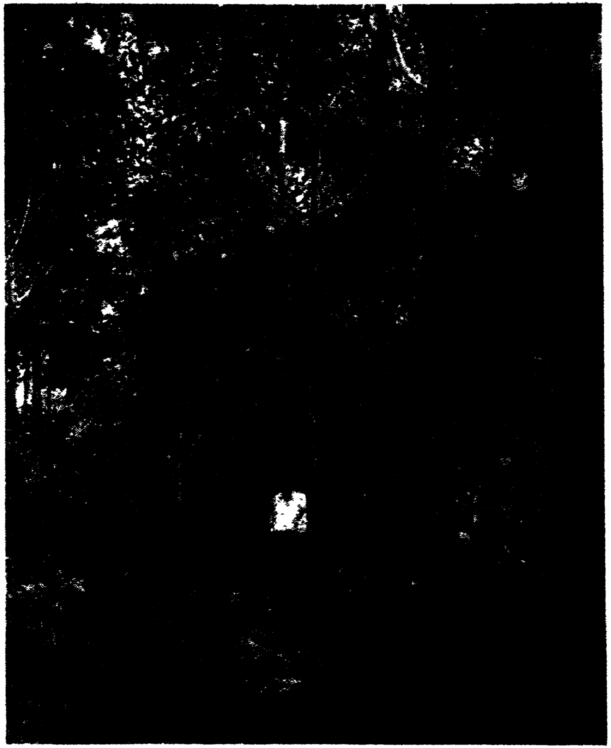


Plate 84.

A PLANTATION OF RED CEDAR AT BARRON

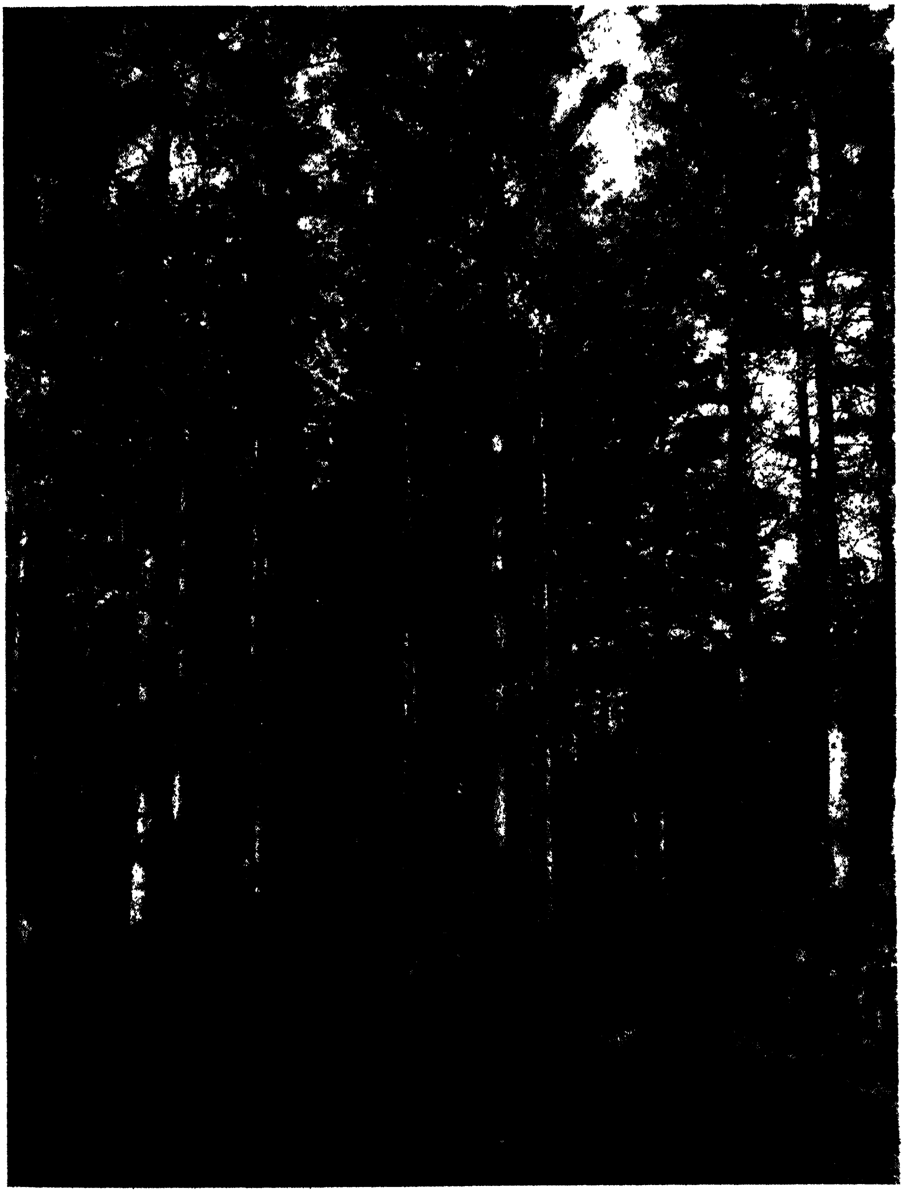


[*Photos: Queensland Forest Service.*

Plate 85.

A SEVEN-YEAR-OLD MAPLE PLANTATION AT GADGARRA, NORTH QUEENSLAND.

Hoop pine is most used by the Queensland Forest Service in its plantation work, but other valuable indigenou ftwoods and cabinet-woods are also included in forestry operations.



[*Photo*: *Queensland Forest Service*.

Plate 86.

A 10-Year-old Silky Oak Stand at Colinton, Brisbane Valley.—The total area of forest plantations in Queensland is now about 20,000 acres. Every year the acreage is increased. State forest reserves, which already cover an immense area in the aggregate, are being extended also in every timber region in which the conditions and requirements of land settlement permit.

[*Photo*: *"Telegraph" Newspaper Company Limited.*

Plate 87.

NATURAL REGENERATION IN A BLACKBUTT FOREST.—The thinning was done by a party of youths working under the Juvenile Employment Scheme instituted by the Queensland Government.

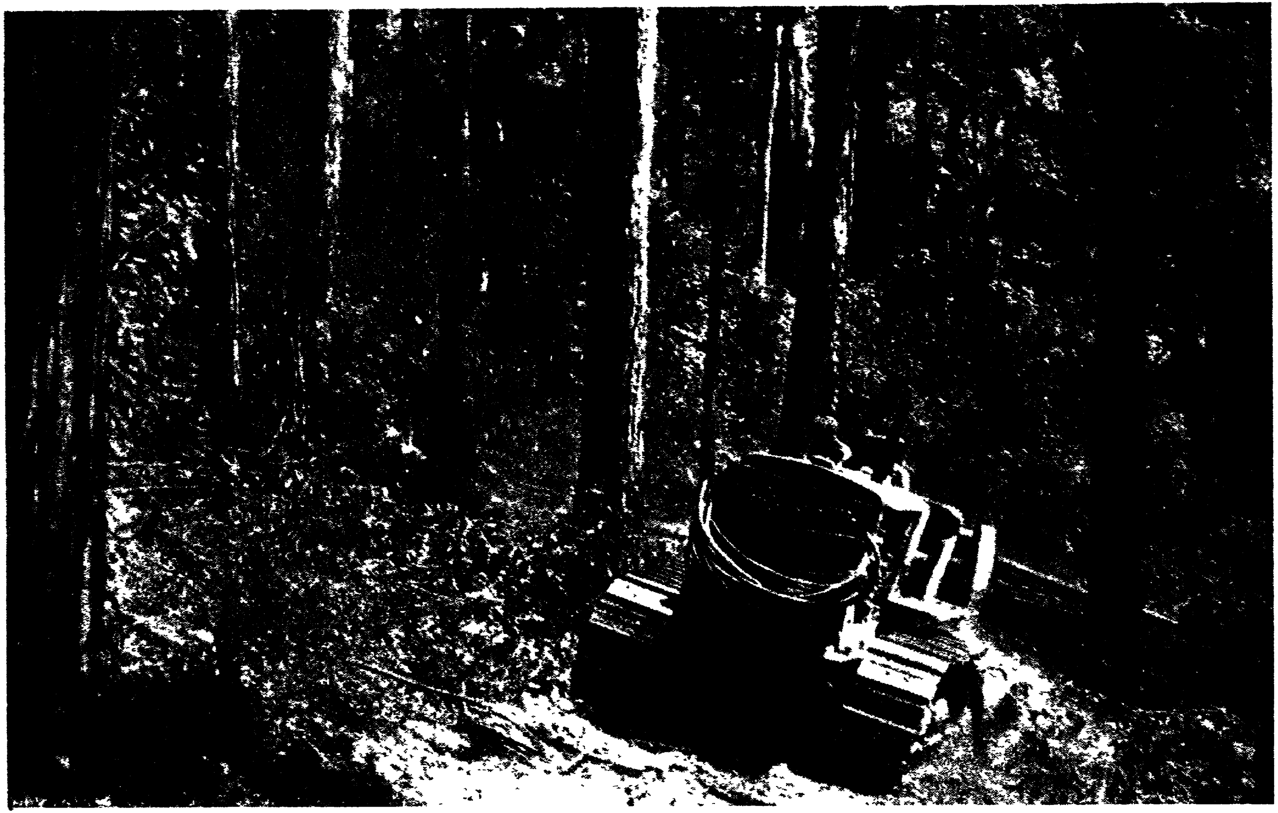


Plate 88.

SNIGGING HARDWOOD LOGS WITH A CATERPILLAR TRACTOR. MAPLETON STATE FOREST.—Over 22 million super feet of hardwood logs are sold annually from Crown forests. In 1935-36 sales of all kinds of timber from State forests aggregated 148 million super feet.

Plate 89. [*Photo*· "*Telegraph*" *Newspaper Coy. Ltd*

WEALTH FROM QUEENSLAND'S TROPICAL TIMBER LANDS.—Stacking Walnut and Silky Oak logs for shipment at the harbour side at Cairns. An electric crane provides the lifting power.

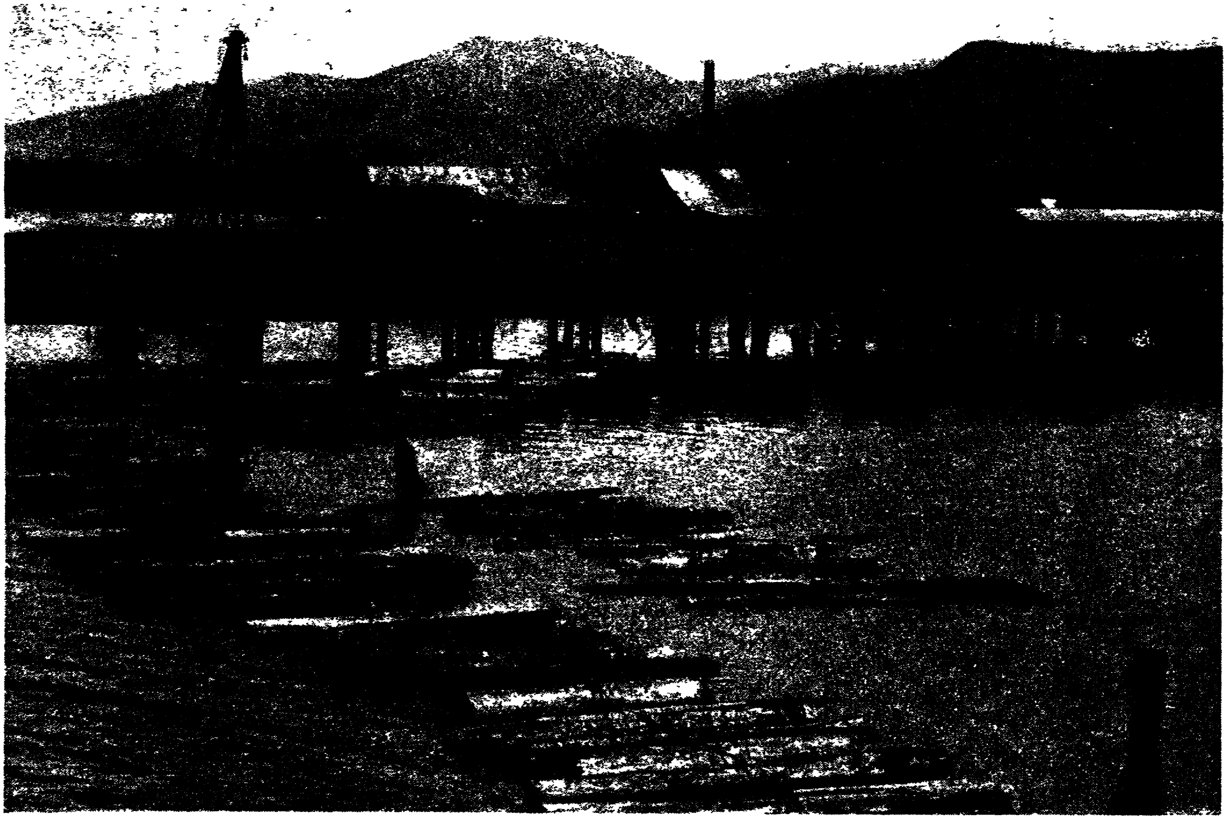


Plate 90.

Logs from the Rain Forests, Atherton Tableland.—Rafts of Kauri Pine awaiting shipment, Cairns Harbour.

The Tropics and Man

Circulation of the Blood.

DOUGLAS H. K. LEE, M.Sc., M.B., D.T.M., Professor of Physiology,
University of Queensland.

Second Series: No. 1.

In the sixteenth century, when the now famous William Harvey proved conclusively that the blood goes round and round the body, time after time, repeating its work over and over again, he was not believed. To-day, every schoolboy knows the way the heart works. If he is a very bright schoolboy, he will probably remember that the left side of the heart pumps bright red blood, full of oxygen, into the arteries; that these arteries take the blood to all parts of the body; that the veins bring darker blood, poor in oxygen, back again to the right side of the heart; and that the right side of the heart pumps it through the lungs, where it takes up oxygen, becomes bright red again, and sends it back to the left side of the heart to commence its trip all over again.

This bright schoolboy will also be able to remember that, not only does the blood pick up oxygen on its trip through the lungs and give it up to the tissues all over the body, but that it also picks up waste matter from these body tissues and takes it away to such organs as the lungs, kidneys, and liver, where these waste materials are taken out and thrown away. Furthermore, pleased at showing off his knowledge, he will describe how food substances are picked up by the blood from the intestines and taken to the tissues which need them, and to store-houses when they are not wanted immediately.

The Work of the Blood.

From the information given us by this bright schoolboy we could lay down some of the important jobs that the blood and the machinery, which sends it round, have to do. Firstly, it has to supply oxygen to all parts of the body; secondly, it has to take waste substances away from all parts; thirdly, it has to supply food to all parts. There are other jobs to be done also, which, although much more subtle and beyond the schoolboy's interest, are equally important. The total amount of certain substances (salts) dissolved in the blood must be just right, not too much of one, or too little of the other. The amounts of acid substances and the amounts of alkaline substances must balance very accurately, so that there is a shade more alkali than acid present. Its temperature must be within certain limits. There must be a certain amount of those substances the chemist calls colloids present and so on.

You see how extraordinarily important and delicate a matter this circulation of the blood is. If it is not pumped to the tissues fast enough, or if it does not contain enough oxygen or food, or if something is wrong with the mixture, then the tissues concerned can no longer work. When, for instance, we do unaccustomed work, our muscles quickly get tired and even painful. The blood supply is not good enough to supply oxygen and remove wastes at the rate required by the active muscles, and they quickly go on strike.

Importance of Circulation in Heat.

You are probably asking why I have spent all this time talking about the blood and what it does, and have said nothing about the tropics, which is what you want to know about. Now there are three systems in the body that are most susceptible to exposure to heat—the nervous system, the ductless glands, and the blood circulation. Moreover, the first two depend a very great deal for their proper working upon the circulation of the blood. If we do not understand how and why the blood circulates, we shall be like the old-time car-owner's wife, who suggested to her begrimed and exasperated husband that he should look and see if the carburettor were short-circuited.

Partial or complete failure of the circulatory system is the commonest cause of chronic or acute distress from exposure to heat. As we might expect, the nervous system is by far the most delicate system in the body, and has the greatest opportunity for making its distress evident. This is a most fortunate circumstance, in that warning signals are displayed at a very early stage. These are usually heeded. Lassitude, dull headache, inability to concentrate are well-known effects of hot days. If they are ignored, attention is usually forced to them, even if fainting is necessary. The body is not permitted to continue with behaviour which might seriously damage vital tissues. Occasionally people of unduly phlegmatic temperament engaged in occupations not requiring skilled concentration, or people acting under a severe emotional urge, overstep these limits and pay with their lives.

How Heat Affects the Circulation.

How does exposure to hot surroundings affect the circulation so that ill effects are apt to ensue? To deal properly with that question would take us into a fairly long and technical discussion; but I think I can give you a fairly simple idea. When the temperature of the skin is raised, all the myriads of tiny blood vessels in it get bigger. This is partly a direct effect of heat, and partly due to the action of the nervous system on these blood vessels. The purpose of this is to allow more blood to pass more quickly through the skin and allow more heat to be lost from it. So long as only a fairly small proportion of the skin surface is heated, or so long as the heating is only moderate, nothing untoward happens. If, however, the blood vessels of a very large area of skin are very much dilated, then the total volume of the blood vessels in the body is very much increased, and there is not enough blood to fill them.

Now you all must have experienced the sensation of working a pump when there is not enough water or kerosene to fill it. The pump wastes its energy on nothing and a very irregular flow comes out. Something of this nature happens when there is not enough blood to fill the blood vessels. Indeed, the result of enlarging the vessels while the amount of blood remains the same is very much the same as that of taking away a lot of blood while the vessels remain the same size, and everyone knows what happens when one loses a lot of blood.

Results of Circulatory Inefficiency.

When there is not enough blood to fill the blood vessels, many parts of the body begin to suffer from lack of blood supply. All parts do not suffer to the same extent since some tissues are much less particular about this than others. Moreover, people vary a good deal in these matters; so that, while one man complains of drowsiness, another complains of indigestion, and a third of fatigued muscles. The symptoms displayed by a deprived nervous system I have mentioned—lassitude, irritability, drowsiness, lack of concentration, dull headaches, and, eventually, fainting. The digestive system signals its protest by loss of appetite (although a certain amount of this is desirable), a feeling of sickness, the vague discomforts we speak of as indigestion or constipation. The feeling of intense muscular fatigue is partly due to loss of nervous power, but partly also to direct muscular protest against a poor blood supply.

Prevention and Cure.

Training is the great factor in preventing circulatory distress. Of course, there are conditions which no self-respecting system can be asked to endure; but, in general, the circulation can be trained to a remarkable degree, as is evidenced by the tremendous feats of well-trained athletes. Common sense is the great principle in training, which dictates a continual but gradual increase of the demand upon the individual adjusted to the individual's response.

Avoidance of all abuse and excess—including the excess of cutting out everything—is essential. Categorically to forbid all popular pleasures is as detrimental as sanctioning unbridled indulgence.

The use of a good mixed diet, a liberal addition of salt, and the drinking of as much plain fluid as is desired go a long way toward helping the circulatory system in its job.

WIND BREAKS FOR BANANAS.

During the recent cold snap, the desirability of retaining suitable windbreaks around banana plantations has been indicated by the number of plantations which have been frosted.

As growers are now falling scrub to plant fresh areas, the necessity of retaining a belt of scrub about 2 chains wide around new areas cannot be too strongly stressed. Where the ground is definitely liable to frosting, it is a good plan to make the track through the scrub or forest into the plantation on a zigzag formation. In areas not liable to frosting, a windbreak will greatly assist in keeping out cold winds which chill the plants and thus retard their growth.

Where plantations are already established, growers should give attention to the planting of windbreaks, of which two types are easily made. Lady's Finger or Sugar bananas planted in close formation round the plantation will produce a thicket, and so afford protection. Several border rows of Java cane will also give some protection against frost and wind.

Growers should remember that too much hard work is put into falling scrub, burning off, logging up, and planting areas to excuse the neglect of reasonable precautions against the possible damage to bananas from frost or cold winds, for one severe frosting followed by a warm day will render their plantations worthless.

W. E. Hamley.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Para Grass.

A.M. (Townsville)—

The specimen is *Brachiaria mutica*, the Para grass, better known in Queensland as *Panicum muticum*. There is no doubt about the palatability and valuable qualities of this grass as a pasture, and for growing in many parts of coastal Queensland in wet places or under cultivation, it is one of the best species that could be planted. It sets very little fertile seed, but it may be propagated easily by cuttings, which root readily and, during the wet season, grow very rapidly.

Bindweed.

A.W. (Kulgun)—

The sample sent by you represents the Bindweed, *Convolvulus arvensis*. This is a native of Europe, now naturalized as a weed in most temperate countries. It is an exceedingly bad weed-pest in the Southern States in Europe, and in North America. It has made its appearance in Queensland on different occasions, but does not spread here to the same extent as it does further south, and seems to be confined to a few isolated patches.

If the patch is only a small one, it is probably better not to disturb the ground, but to cut the green shoots down as they appear. A weak arsenical solution poured into the patch could be tried. It is, generally speaking, better to use a large amount of weak solution, than a small amount of strong. If it is decided to fork the plant out, care should be taken that the under ground parts are not carried about, as even a small piece dropped, may develop into a new plant.

Pigs are fond of both the underground and above-ground growth of Bindweed, and where it is very bad, if the land is ploughed, the pigs will help in removing the underground parts. They have been quite successful for this work in Queensland in the few patches where the weed has made its appearance.

Bristle Poppy.

Inquirer (Jondaryan)—

The specimen forwarded by you bears no flowers, but we should say it is the bristle poppy or spiny poppy (*Papaver aculeatum*), a plant with rather a peculiar distribution, being found in the Eastern Australian States, and in South Africa.

In the Southern States, it is a minor weed-pest, but is not so abundant in Queensland, and so far as we have observed, has not proved itself an aggressive pest.

Valuable Fodder.

F.P. (Maleny)—

Brachiaria mutica, better known in Queensland as *Panicum muticum*, also as Para grass and giant couch, is an excellent, nutritious, and palatable fodder, and a small paddock of it is very useful for periodical feeding off. It does not do particularly well in Southern Queensland in the ordinary pasture, but requires cultivation or rather damp conditions. It is particularly useful for growing along creek banks or in swampy localities. It is frost tender. It is not known to be poisonous or harmful at any stage of its growth. It is propagated from cuttings. The seed, generally speaking, possesses a very low percentage of fertility.

Ivory Wood.

J.H. (Porter's Gap, via Bell)—

The specimen you sent me is the Ivory Wood, *Siphonodon australe*, a native of the drier scrubs of Southern Queensland. The fruits are not known to possess any poisonous properties. They were said to be eaten by the aborigines in the early days, but they always seem to be too hard and woody to be of any value as food.

Wattle and Grasses.

K.E. (Chinchilla)—

The smaller wattle in flower is *Acacia decora*. We have not heard a local name given to it, though it is exceedingly common on parts of the Darling Downs, Maranoa, and Burnett districts. It is certainly very decorative, and the specific name is quite appropriate.

The wattle in flower is *Acacia Cunninghamii*, commonly known in Queensland as black wattle.

The tall oat grass of the Darling Downs is *Themeda avenace*, the genus *Anthistiria* having given way to *Themeda* on the score of priority.

Kangaroo grass is *Themeda australis*.

From your description, we think that Leichhardt's "vitex" must have been the sandal-wood or budda, *Eremophila Mitchellii*. This is certainly very common and rather a beautiful sight when in flower.

Wilga is *Geijera parviflora*. We were very interested in your remarks on the advancement of the brigalow in the Dawson country. We certainly think that the brigalow and mixed soft-wood scrub is the dominant type, and as your informant says, has spread gradually over the plains. We have seen a form of brigalow and mixed scrub in the making.

Serious Menace, Common Weeds.

Inquirer (Toowoomba)—

The European Bindweed, *Convolvulus arvensis*, is one of the worst of the European and North American weeds. It is fairly common in the Southern States. It has appeared in Queensland at different times, and during the past five or six years it has been seen several times as a weed of the Darling Downs, mostly in small patches in cultivation areas. Fortunately, it does not seem to spread here to anything like the extent it does in more temperate places, but it is certainly a very serious menace, and there is no telling when it will spread to a greater extent than it is doing at present.

The only suggestion we can offer is the one you have made, namely, spraying with a weak solution of weedex or other weed spray, each time any fresh growth appears. This will eventually exhaust the underground root stock. It may be advisable to fork the patch over and spray the patch; but, of course, care must be taken that the pieces are not carried from one part of the farm to another as every little piece of the plant dropped, is capable of forming a fresh patch. Mr. W. Deacon, M.L.A., formerly Minister for Lands, told us that he had a few patches of this weed on his farm, and found that pigs were very useful in getting rid of it, being very fond of the white, underground parts. Pigs have been used elsewhere to aid in its eradication; the only thing against it in Queensland is that at present the plant is mostly found in very small patches, and pigs might easily spread it about from one part of the farm to another.

Inquirer (Mareeba)—

Crotalaria sericea is a native of India, but is now a very common weed in Queensland, being found along the coast from Brisbane to the far North. It is a showy, rather attractive plant, and has been suspected on one or two occasions of poisoning stock. Nothing definite, however, is known about it and so far as we have observed, stock seem rarely to eat it in any quantity. Though a fairly abundant weed in parts, we cannot say that it is fairly aggressive or that it calls for particular means of eradication. It is very close, if not conspecific, to a species that has been imported into Queensland, namely *S. spectabilis*.

East Moreton Plants Named.

G.G. (Mount Beppo)—The specimens have been determined as follows:—

1. *Echinochloa Crus-galli,* wild millet. This grass is very closely allied to such well-known cultivated fodders as Japanese millet and white panicum.
2. *Setaria glauca,* a pigeon grass. This grass is closely allied to such well-known cultivated fodders as Manchurian millet and Hungarian millet. It mostly occurs either as a weed of cultivation or in damp pastures.
3. *Eragrostis poeoides,* a species of love grass. The love grasses are very common in Queensland, and, though only of secondary value as fodders, probably play some useful part in the general mixture.
4. *Paspalum dilatatum,* common paspalum.
5. *Eleusine indica,* crowfoot grass. This grass is very widely spread over the sub-tropical and warmer regions of the world. It is very common in Queensland, and mostly occurs as a weed of cultivation. It contains a prussic-acid-yielding glucoside, but very little trouble is experienced from it in Queensland.
6. *Chloris virgata,* feather topped Rhodes grass, or woolly topped Rhodes grass. This grass is very common in many parts of Queensland, and though rather a luscious-looking grass, is not generally eaten by stock to any great extent. They seem to eat it readily enough, however, in the form of hay. This grass has invaded much of the lucerne-growing country of South Queensland, particularly in the Lockyer valley, and has decreased very considerably the earning capacity of some of the lucerne paddocks.
7. *Chloris divaricata,* a star grass. The native star grasses or windmill grasses are mostly good fodders, making good bottom feed, particularly for sheep.
8. *Themeda australis,* kangaroo grass, a very valuable native grass, but does not stand up to heavy stocking.
9. *Chloris gayana,* Rhodes grass.
10. *Eriochloa sp.,* sometimes known as early spring grass in Queensland. They are good fodders, but the local name is not particularly appropriate, as they are not much earlier, or any earlier, than many other native grasses which come up with early summer rains.
11. *Digitaria marginata,* summer grass, a useful fodder, mostly occurs as a weed of cultivation or in rather sandy tracts in the pasture.
12. *Bothriochloa decipiens,* bitter or pitted blue grass. This is an inferior species of blue grass, sometimes called coastal blue grass. It is the dominant species in many pastures, due to the better and more palatable kinds being eaten out.

Some Poison Plants.

J.H.McL. (Kilkivan)—

1. *Solanum seaforthianum,* a native of tropical America, now a common naturalized weed in many scrub areas in Queensland. It belongs to a dangerous family, and the berries have been accused of poisoning children, though not fatally and of poisoning poultry. So far as we have observed, stock rarely touch the plant, as it has a rather nauseating flavour. We should say, however, that it would be decidedly unwholesome.
2. *Solanum nigrum,* black night shade. The ripe berries of this plant are frequently eaten by children without any ill effects following, but the green berries and green parts generally contain a poisonous principle solanin, which tends to disappear in the ripe fruits. The green parts of this plant are poisonous, but rarely seem to be eaten by larger stock such as cattle in sufficient quantities to cause trouble.
3. *Rivina laevis,* a very common weed in many scrub areas in Queensland, but one for which we have not heard a distinctive local name. It is not known to be poisonous or harmful in any way, but gives a rather offensive taint to milk and cream.
4. *Rhynchelytrum repens,* red natal grass. This grass is a very common grass in many parts of Queensland, particularly as a weed of cultivation. It is only of secondary value as a fodder; in coastal areas it is a very common weed on fruit farms, and has been found there to make excellent chop-chop for horses, and for dairy cows, either by itself, or mixed with better class fodders. It is not known to be poisonous or harmful at any stage of its growth.

Grasses and Sedges.

A.II. (School Project Club, Jandowae)—Nos. 1, 2, and 3. No specimen received.

4 and 5. *Eragrostis parviflora*, weeping love grass, a very common grass in Queensland pastures, particularly in the damper situations. The love grasses, on the whole, are of only secondary value as fodders, but, nevertheless, play perhaps an important part in making up the average native mixed pasture.

6 and 7. *Aristida calycina*, a three-pronged spear grass or wire grass. On the whole, they are of little value as fodders, though they will be eaten by cattle to some extent when young.

8. *Tragus racemosus*, small burr grass, a very common grass in many parts of Queensland, particularly on the Downs country. It provides a bite for sheep, but is of little value for larger stock. The burr-like seeds are an objectionable feature.

9 and 10. *Chloris virgata*, feather top Rhodes grass, or woolly top Rhodes grass. This grass, though rather a luscious-looking grass, is apparently unpalatable to stock. It has invaded much of the lucerne-growing country in Southern Queensland, particularly in the Lockyer valley, and has much reduced the earning capacity of some of the lucerne paddocks. Stock are said to eat it readily enough in the form of hay.

11 and 12. Very young specimens, but apparently the same as No. 4.

13. *Bothriochloa intermedia*, forest blue grass. This is the commonest native grass in much country on the Northern Darling Downs, the Burnett district, and Callide valley.

14. *Chloris gayana*, Rhodes grass.

15. *Eragrostis leptostachya*, paddock love grass. (See note on No. 4.)

16, 17 18, 19. *Cyperus difformis*, a sedge, not a true grass. The sedges, on the whole, have not the same value for fodder as the true grasses. A book soon to be published by the Department of Agriculture and Stock on ''Principles of Botany for Queensland Farmers'' will give you the differences between grasses and sedges. You should get your head teacher to obtain a copy for the school library.

20. *Eriochloa sp.*, early spring grass. The early spring grasses are very palatable fodders. The local name is not particularly appropriate, for though they come up with the early summer rains, they are no earlier than many other of the native grasses.

21. *Echinochloa colona*, wild or barnyard millet, a valuable fodder grass, closely allied to such well-known cultivated fodders as Japanese Millet or white panicum It is mostly found either as a weed of cultivation or in damp spots in the pasture.

22, 23, 24, *Eriochloa sp.* (See notes under No. 20.)

25. *Eragrostis cilianensis*, stink grass, a native of Southern Europe, now a common naturalized weed in most warm temperate countries. In Queensland it is mostly found as a weed of cultivation, and, on the whole, is not eaten to any great extent by stock. The name stink grass comes from peculiar glands along the edge of the leaf, which give it the characteristic and not altogether unpleasant odour.

26. *Chloris ventricosa*, a star or windmill grass; the native chloris grasses or windmill grasses are valuable fodders.

27, 28. *Alternanthera denticulata*, a weed of the Amaranth family. (Amarantaceae). We have not heard a common name applied to it, but it is generally regarded as quite good fodder for stock.

29. Looks like a form of *Eragrostis parviflora*, weeping love grass.

30. *Sorghum sp.* This is either sudan grass, *S. sudanense*, or the wild sorghum, *Sorghum verticilliflorum*, but more complete material is required to be certain.

31. *Apsium leptophyllum*, wild carrot, a common weed of cultivation, and sometimes seen in ordinary pastures. It taints milk rather badly.

32. *Digitaria marginata*, summer grass, a very common grass in Queensland, mostly seen as a weed of cultivation—sometimes in the more sandy pasture country. It is quite a good fodder.

33. Looks like a species of *Commelina*, but specimen too poor to be sure. Species of Commelina are sometimes called scurvey grass in Queensland, and the leaves make quite a good vegetable, but they are some trouble to collect.
34. *Amarantus interruptus*, a very common weed of the Amaranth family (Amarantaceae). Probably quite a good fodder.
35. *Eragrostis elongata*, a love grass. (See remarks on No. 4.)
36. No inflorescence, but looks like nut grass, *Cyperus rotundus*. This is a sedge, and not a true grass.
37. *Setaria glauca*, a pidgeon grass. This grass mostly occurs either as a weed of cultivation or in damp spots in the pasture. It is very closely allied to such well-known cultivated fodders as Hungarian millet, Manchurian millet, &c.
38. *Heleocharis plana*, a sedge, not a true grass.
39. *Cyperus sp.* Inflorescence too broken to identify. This is also a sedge.
40. *Cyperus concinnus*, a sedge. The inflorescence is too young to be sure of its specific name.
41. *Sporobolus pallidus*, fairy grass.
42. *Cyperus laxus*, a sedge.

Wild Millet.

F.C.T. (Goondiwindi)—

The grass is wild millet, *Echinochloa Crus galli*, which is widely spread over the warm temperate regions of the world. It is a very good fodder, and is closely allied to such well-known cultivated grasses as Japanese millet and white panicum. In Queensland it mostly occurs either as a weed of cultivation in country where the ground has been disturbed, or in rather damp situations in the pasture. We should thing it worth encouraging and trying in a new barn.

Varying Fodder Values.

F.J.I. (Miles)—

1. It is difficult to name grasses in the absence of seed-heads, but the present specimen appears to be *Cynodon dactylon*, the common couch, a very nutritious and palatable fodder grass, but not making very heavy growth.
2. *Aristida caputmedusae*. This is one of the wire grasses or three-pronged spear grasses. It is very common in sandy forest country on the Darling Downs and Maranoa districts. It has a very limited use as a fodder, but will be eaten by stock, particularly cattle, in its younger stages.
3. *Perotis rara*, comet grass, a very common grass in many parts of Queensland. The local name comes from the similarity of the seed-spike to the tail of a comet. It has little value as a fodder, but perhaps is of some importance in making up the general mixed native pasture, particularly on poorer-class country.
4. *Eleusine indica*, crowfoot grass, a very common grass widely spread over the warm temperate and sub-tropical regions of the world. In Queensland it mostly occurs as a weed of cultivation, and is moderately palatable. It contains a prussic-acid-yielding glucoside, but trouble from it in this State is very rare. The grass, of course, is not to be confused with crowfoot, the common herbage of the Darling Downs.
5. Impossible to determine from the material sent. May be a rush or a sedge, but flowers or seed-head required.

Blue Panic Grass.

D.C. (Chinchilla)—

The specimen forwarded was in a very young state; but there is no doubt it represents the blue panic or giant panic, *Panicum antidotale*. This grass has received a good deal of publicity of recent years, and it is undoubtedly quite a valuable standing feed, although, so far as we have observed, it seems to do best under cultivated conditions. It makes rather a caney stem, but sends tufts of leaves out here and there at different points along the main stems, and these are much relished by cattle. Seed is obtainable through the ordinary commercial channels.

Grasses and Weeds.

J.C. (Calvert)—

1. *Cyperus difformis*, a sedge. In a work shortly to be published by the Department of Agriculture and Stock on "Principles of Botany for Queensland Farmers," the difference between sedges, grasses, and allied plants will be given.
2. *Achyranthes aspera*, chaff burr, a common weed in many parts of Queensland, both on the coast and inland. It is not known to possess any poisonous or harmful properties, and we cannot say that we have seen stock eat it to any extent.
3. *Alternanthera denticulata*, a weed of the amaranth family (Amarantaceæ). We have not heard a local name applied to it. It should be quite a useful fodder.
4. Looks like *Stachys arvensis*, stagger weed or wild mint. This plant causes shivers or staggers in working or travelling stock. Ordinary resting paddock stock such as dairy cattle, cows, &c., eat the plant with impunity. In fact, for them it seems quite a useful fodder.
5. *Teucrium argutum*, a native weed for which we have not heard a common name. When it grows in cultivation paddocks, it possesses white underground runners, which are much liked by pigs. When eaten, however, they cause animals to become highly excited and rush about until they become exhausted.
6. *Chenopodium carinatum*, a weed of the saltbush family. It contains a prussic-acid-yielding glucoside, and has been known to kill sheep in New South Wales.
7. *Chenonpodium triangulare*, fishy weed, a plant of the saltbush family, not much eaten by stock in the green stage, but when made into hay seems to be quite palatable. The green plant, if eaten by cows, imparts rather a fishy flavour to milk and cream, hence the local name.
8. *Panicum decompositum*, barley grass.
9. *Eragrostis leptostachya*, paddock love grass. The love grasses are not particularly good fodders, but nevertheless play rather an important part in the mixed native pasture.
10. *Zornia diphylla*, a native legume for which we have not heard a local name.
11. *Cyperus concinnus*, a sedge.
12. *Eragrostis parviflora*, weeping love grass.
13. *Cassia bicapsularis*, a native of tropical America, now widely cultivated as a garden shrub in most warm countries. It is most frequently known to nurserymen as *Cassia candolleana*.
14. *Jasminum suavissimum*, a native jasminth.
15. *Geranium dissectum*, native geranium, a useful fodder.

Arsenic Weed.

G.R.S. (Biggenden)—

The specimen forwarded by you under the name of Arsenic Weed is *Cassia sophera*, a native plant very widely scattered through Queensland. It has been suspected of causing losses among stock at different times, but We have not seen stock eat it to any extent. If eaten by them, it is almost sure to have a purgative effect, as it belongs to the same genus as the shrub producing the senna leaves of commerce. We have been told, and the evidence seems fairly good, that deaths have been caused by feeding on the young shoots of this weed. In respect to the local name, however, there is no connection, we should say, between the arsenic found in the stomach of the poisoned cow and this weed.

Grass out of Favour.

E.R.A. (Bowen)—

The specimen represents *Paspalum urvillei*, a native of Southern Brazil and the Argentine. This grass was boomed as a fodder some years ago, under the name of *Paspalum virgatum*, but has since gone out of favour.

Weeds of Cultivation.

G.R.S. (Biggenden)—

1. *Indigofera hirsuta*, hairy indigo, a fairly common weed of cultivation in many parts of Queensland, particularly in the Central coastal districts. Personally, we have not known stock eat it to any extent, but have been told by several experienced stockowners that both cattle and horses eat it readily enough, particularly when drying off slightly.

2. *Deeringia celosioides*, a very common plant of the Amaranth family (Amarantaceæ). It mostly grows in the rather drier scrubs, on scrub edges, and is frequently common in the Burnett and Callide Valleys as secondary growth. We have not heard a local name given to it. It is not known to possess any poisonous or harmful properties at any stage of its growth.

3. *Malvastrum spicatum*, a very common weed of the mallow family. We have not heard a distinctive local name given to it. It is sometimes called *Sida retusa*, but the true *Sida retusa* is a rather different plant.

4. *Cenchrus australis*, hillside burr grass, or scrub burr grass. This grass is very common throughout the coastal and near coastal belt of Queensland. It is particularly abundant along scrub edges. We should not say it had much value as a fodder. It is a very common weed of parts of the Atherton Tableland, and is known there by the rather absurd name of scotch lice. Insects sometimes get entangled and caught in the hooked burrs of the seed head.

Fodder Grasses.

W.E.T. (Mitchell)—The three specimens have been determined as follows:

1. *Chloris virgata*, feather top or woolly top, sometimes called feather top or woolly top Rhodes. This grass mostly occurs in Queensland as a weed of cultivation. It is rather a luscious-looking grass, but on the whole we have found that stock do not eat it very readily. It is said to be much more palatable in the form of hay. Of recent years this grass has very badly infested many of the lucerne-growing districts, and very much reduced the earning capacity of some of the lucerne paddocks.

2. *Echinochloa colona*, wild millet. This grass is a very good fodder, and is closely allied to such well-known cultivated fodders as Japanese millet and white panicum. In Queensland it mostly occurs either as a weed of cultivation or in rather damp places in the pasture.

3. *Eleusine indica*, crowfoot grass. We have heard this grass called holdfast, on account of the very tenacious hold it has on the soil. It is moderately palatable to stock, but, like sorghum and some other fodders, contains a prussic-acid-yielding glucoside. Very little trouble, however, is experienced with it in Queensland. It mostly occurs where the ground has been disturbed, such as old cultivation areas, around cowyards, and along rail way embankments, and is not usually seen as a member of the ordinary pasture.

All grasses are summer growers.

Madagascar Plum. Mesquite Bean.

"Sap" (Townsville)—

The fruit forwarded by you is *Flacourtia cataphracta*, commonly known in Queensland as the Madagascar plum. It is a very pleasant fruit to eat, and the reason why some trees are barren is that the male and female flowers are borne on distinct trees.

The bean forwarded under the name of Urandangie pest is the mesquite bean, *Prosopis juliflora*, a native of South America, the West Indies, Central America, Mexico, and the southern United States. It is now widely cultivated in tropical countries as a fodder and ornamental tree. We have realized, however, the possibility of this plant becoming a pest in Queensland, somewhat in the same way as the Parkinsonia Tree has in parts of New South Wales. Any particulars you could give about the spread of this tree about Urandangie would be much appreciated.

Potato Bush.

M.L. (Brisbane)—

The specimen forwarded by you is a species of Solanum or Potato Bush. A number of these are naturalized in Queensland, and are very common on much of our pasture country on the Downs and inland generally. The piece you send is a very small piece indeed, and as many of these are so much alike, we would very much like to have a larger specimen to make sure, but yours is either *Solanum ellipticum,* the spiny potato bush, or *Solanum cinereum,* the narrawa burr. These plants are at times very common, but we have not seen them in sufficient quantities to class them as a serious pest.

Salt Weed.

Inquirer (Cunnamulla)—

The specimen forwarded represents the shrub salt wort or salt weed, *Arthrocnemum halocnemoides,* sometimes called the shrub glass wort, or glass weed, due to the fact that these plants are rich in soda. An allied species in the early days was used in Europe in the manufacture of glass. It belongs to the saltbush family (Chenopodiaceæ).

Crowfoot.

J.J.S. (Helidon)—

It is rather difficult to name specimens of plants in the very young stage, but we do not think there is any doubt that yours represents the Crowfoot, *Erodium cygnorum,* a very common herb on the Downs country and Southern Queensland. It belongs to the geranium family (Geraniaceæ). It is not as valuable a fodder as the native geranium.

A Good Native Grass.

M.J.C. (Westwood)—

Your specimen proved to be *Brachiaria praetervisa,* a native grass, quite a good fodder, but one for which we have not heard a local name. Practically all the brachiarias are useful fodder grasses, but the present one, like others, seems to prefer cultivated ground, or ground that has been disturbed, rather than the ordinary pasture. This is unusual in native grasses.

Leguminous Herb. "Devils' Fig."

B.D. (Ingham)—

1. *Cassia mimosoides,* a common leguminous herb of rather woody character, usually found in grass country throughout coastal and North Queensland. It is not known to possess any particular properties, useful or otherwise. We have not seen stock eat it to any extent, but it would probably be quite a useful fodder. Some of the cassias cause purging.
2. *Solanum torvum,* a very common weed, widely spread over the tropical countries of the world. It is quite common in parts of coastal Queensland and in some areas is regarded as rather a serious pest. It is most frequently known as "devil's fig."

Possibly Valuable Legume.

Inquirer (Brisbane)—

The specimen from Gracemere is *Stylosanthes guianensis,* several of which have been imported at different times following on the success that an allied species, *S. sundaica,* has been in parts of Queensland. This latter species has certainly very much improved the carrying capacity of much of the country in North Queensland, particularly about Townsville. We have seen several specimens of the plant, but have not seen fertile seed. This does not say, of course, that fertile seed is not produced, but unless it is, the plant is of very little value for Queensland. If it does produce fertile seed, then we think it is a valuable legume, and should approximate lucerne in feeding value. It will grow under more tropical conditions than ordinary lucerne, and is valuable in this respect. We have found with *S. sundaica,* the common Townsville lucerne or wild lucerne, that stock prefer it in a wilted condition to green and luxuriant.

Scrub Panicum.

Inquirer (Brisbane)—

The specimen submitted is the *Setaria australiensis*, commonly called in Queensland the scrub panicum, a native grass frequently seen around scrub clearings, along scrub tracks, etc. It is generally regarded for such places as quite good fodder, but it is hardly worth cultivating, for where it should grow, better fodders, such as giant setaria or Manchurian millet, which are very closely allied to it, would grow equally well. Seed of the scrub panicum is not stocked by nurserymen, but the giant setaria is obtainable through commercial channels at a fairly cheap rate.

Galvanised Burr.

Inquirer (Pittsworth)—

The *Bassia birchi*, or galvanised burr, a sample of which you have sent, is a native of Central Queensland. Within comparatively recent years it has spread over much land, particularly on stock-routes, or on land that is heavily stocked. It has caused some concern to graziers, and the Council of Scientific and Industrial Research is carrying out experiments on the weed in the neighbourhood of St. George.

Gooseberry Cucumber.

J.P.D. (Kingaroy)—

One of the specimens sent is the Gooseberry Cucumber or Paddymelon, *Cucumis myriocarpus*, a native of South Africa. It is now very common as a weed in many parts of Queensland, particularly on the Darling Downs. It is generally regarded as harmful to stock, but feeding experiments in Australia, so far as we know, have given negative results. In South Africa, however, it has been proved that the watery sap is poisonous, particularly that of the ripe fruits. The rinds and seeds are quite harmless. The symptoms are severe purging, and in some animals, vomiting.

Native Pasture.

C.C. (Maryvale)—

Your specimen represents the common Kangaroo grass, *Themeda australis*. This is a native grass. It is one of the better grasses of the native pasture, although, when it becomes mature, it is rather fibrous. It is considered to be a fairly good fattening grass for cattle, although some of the softer kinds of grasses, such as the native panicums, form a useful addition to the pasture.

Leguminous Plants.

"Sap" (Townsville)—

What you have sent is *Atylosia scarabaeoides*, a leguminous plant, which is widely spread in India and Malaya, and parts of Melanesia. Unfortunately, we have no records of its fodder value. However, as you say it is readily eaten by stock, we think that is a fair indication that it is a good fodder plant. Many native leguminous plants are strictly avoided by stock, and this gives one the impression that they are either unpalatable or harmful.

Indian Heliotrope.

Inquirer (Rockhampton)—

Heliotropium indicum (Indian Helliotrope) is a native of tropical Asia, but is now a naturalised weed in parts of Queensland. It is particularly abundant about Rockhampton. It is not known to possess any poisonous or harmful properties.

Wild Sunflower. Black Nightshade.

F.A.S. (Columboola, W. Line)—

(1) *Verbesina encelioides*, wild sunflower. This plant has been definitely proved by feeding tests to be poisonous to sheep.

(2) *Solanum nigrum*, black nightshade. The green parts of most *solanums* are poisonous to stock. If the present plant were eaten to any extent it, would be harmful. It is not usually eaten by stock in sufficient quantities to cause trouble, although the specimens you sent show marked signs of having been trimmed by stock.

General Notes

Staff Changes and Appointments.

Messrs. P. A. Kelly and R. E. Watson, inspectors of dairies, Department of Agriculture and Stock, have been transferred from Oakey to Goombungee and Goombungee to Oakey, respectively.

Constables V. Jensen (Thangool) and F. A. S. Goodwin (Jundah) have been appointed also inspectors under the Slaughtering Act.

Mr. W. J. Richardson, cane tester, has been transferred from the Babinda Mill to Tully Mill. Miss M. A. Morris has been appointed a cane tester at the Babinda Mill, and Mr. C. W. Steley an assistant cane tester at the Tully Mill, Tully.

Constable W. Mollenhauer, Isisford, has been appointed also an Inspector under the Slaughtering Act.

Senior Sergeant E. O. Hall, Charleville, has been appointed also an Inspector under the Slaughtering Act.

The following have been appointed assistant cane testers for the forthcoming sugar season at the mills indicated:—Miss D. Aldridge (Millaquin), Mr. R. Anderson (Fairymead), Miss K. Backhouse (Moreton), Mr. A. Byrne (Millaquin), Miss P. Eadie (Bingera), Mr. G. R. Kronk (Maryborough), Mr. J. Kinnon (Fairymead), Mr. C. M. Martin (Bingera), Mr. R. A. Stephenson (Moreton), Mr. W. P. Snewin (Isis), and Miss P. Thorburn (Isis).

Mr. J. Wagner, Howes and Melton roads (Nundah), has been appointed an honorary ranger under the Animals and Birds Acts.

Mr. R. C. Cannon, B.Sc.Agr., Field Assistant, Department of Agriculture and Stock, has been appointed Instructor in Agriculture, Dimbulah.

The following have been appointed cane testers for the forthcoming sugar season at the mills specified:—Messrs. C. J. Boast (Isis), P. H. Compton (Bingera), T. F. Corbett (Moreton), T. D. Cullen (Millaquin), T. Herbert (Gin Gin), L. C. Home (Mount Bauple), J. Howard (Rocky Point), J. McFie (Maryborough), and Misses A. L. Levy (Fairymead) and J. O'Flynn (Qunaba).

Boundaries of Northern Stallion District.

A Proclamation has been issued under the Stallions Registration Acts altering the boundaries of the Northern Stallion District to include the Petty Sessions Districts of Ingham, Herberton, Atherton, and Mareeba.

Sectional Group Committee Electorates.

Regulations have been issued under the Fruit Marketing Organisation Acts providing that, for the purpose of electing members of the Banana, Pineapple, Citrus, Deciduous, and other Fruits Sectional Group Committees, certain local producers' associations and groups of associations throughout the fruitgrowing districts of the State shall constitute electorates, and shall elect the members of the various sectional group committees.

Qualifications in Veterinary Science.

An Order in Council has been issued in pursuance of the provisions of "*The Veterinary Surgeons Act of* 1936" providing that the degree or diploma in veterinary surgery of the Royal College of Veterinary Surgeons, Great Britain, the United States College of Veterinary Surgeons, America, the Universities of Sydney, Melbourne, and Queensland, shall be recognised as entitling the holder or member, as the case may be, to practise as a veterinary surgeon. For the purposes of the Act also an Order in Council has been issued declaring the Queensland Agricultural High School and College, the Hawkesbury Agricultural College, and the Wagga Experimental Farm, New South Wales, the Roseworthy Agricultural College, South Australia, the Dookie Agricultural College, Victoria, and the Muresk Agricultural College, Western Australia, to be Institutes affording a training in veterinary science.

Wild Life Preservation—A Goondiwindi Sanctuary.

A sanctuary under the Animals and Birds Acts embracing the property of Mr. P. A. Wright, "Kindon," Goondiwindi, has been declared. Mr. C. D. McKenzie, manager of "Kindon," has been appointed an honorary ranger under the Acts.

Rural Topics

Whitewash Hints.

Whitewashing is usually regarded as a very poor substitute for painting, but when properly done it has many uses for which paint is not suitable. One advantage is the ease and rapidity with which it can be applied, and its cheapness is another recommendation. The surface to be whitewashed should be just as clean as one that is to be painted, and it is a first essential to good results that all dirt, dust, grease, and scaly material should be removed before there is any attempt to apply the wash. This implies a liberal use of scrapers and stiff brushes. When the cleaning is finished, and the surface dusted, it is well to dampen it slightly just before applying the wash. Whitewash may be applied with the brush or sprayer. Let the coat be fairly thin and transparent and it will be opaque when dry. In using sprayers it is necessary that the wash be strained through at least two thicknesses of cheese cloth. In estimating the quantity of material required many problems and conditions are encountered, but the following general figures may be used as a basis: One gallon of whitewash will cover approximately 225 square feet of wood, 180 square feet of brick, and 270 square feet of plaster. Using a 4-inch brush a man will cover 200 square feet of ceiling, 200 square feet of rough wall, or 350 square feet of smooth wall in one hour. Prepare the lime and water paste a few days before using. Where casein, glue, or formaldehyde are to be used, the solutions must be brought together only when they are quite cold. This is very important. The solutions mentioned should be added very slowly and at the same time they should be stirred vigorously and constantly.

In no case should you mix more of the wash in one day than you can use in that day when using any of the solutions mentioned above. Skim milk may be used as a substitute for casein, but it is not quite so effective. In place of one sack (50 lb.) of hydrated lime, you may use the paste made by slacking ½ bushel (38 lb.) of fresh quick-lime with about 6 gallons of water. This slaking is sometimes done by placing the quick-lime in a barrel and adding the water boiling hot. If cold water is used the water may be added a little at a time, stirring each time; when heat ceases to be given off the lime is slaked. Before using, strain this paste through a fine screen.

Molasses is said to render the lime more soluble and to give it a greater penetrating power. Use in proportion of 1 pint of molasses to 5 gallons of the wash. Alum tends to prevent rubbing and is used in proportion of 1 oz. to 1 gallon of the wash. If a gloss is desired, dissolve 1 lb. of bar soap in a gallon of boiling water, and when it is cold add to 5 gallons of the thick wash.

Two Weeds Poisonous to Stock.

On the Darling Downs, in the Maranoa district, and in some other parts of Queensland, there is a very common weed sometimes seen in cultivation and along watercourses. It is upright in growth, about 3 feet high, with white flowers followed by a spiny seed pod, splitting at the top into four parts, and containing a large number of blackish seeds. In the districts mentioned it generally goes under the name of castor oil and the question is often asked if it is the true castor oil of commerce.

The fact is that the true castor oil is a different plant. The seed pods are superficially alike, but the plant is very much larger. Instead of being a small weed of cultivation, it is a shrub, or even a small tree, up to 10 feet high. It is very common around vacant allotments in coastal towns, and along creek and river banks in the near coastal districts. The seeds of the true castor oil are also poisonous and have sometimes been eaten in the mistake that they would have the same effect as a dose of castor oil. People who have accidentally or intentionally eaten the seeds have become violently ill, and it is said that in some cases even death has ensued. When the oil is expressed from castor oil seeds the residue contains a poisonous principle and this precludes the use of castor oil cake as a stock food.

The other plant is stramonium or thorn apple, and all parts of this plant are poisonous. It possesses a nauseating odour and flavour, and, on this account the standing plant is rarely eaten by stock. On several occasions, however, the seeds and parts of the dried plant have been found as an impurity in chaff and have caused the deaths of working horses and town cows. The seeds of this plant are the most poisonous part and poultry should not be allowed to run where the plant is growing.

Stock Foods and Feeding.

To get the best returns from their livestock, producers should know not only the best combinations of foods, but the mechanical condition in which they should be given.

Broadly speaking, foodstuffs may be classed as concentrates and roughages; and the type of animal and the purpose for which it is used should determine the condition in which the foodstuffs are fed.

No stock owner should purchase equipment for chaffing, grinding, crushing, soaking, or cooking foodstuffs until he is convinced by trial that the extra returns will repay the cost.

The argument most commonly advanced in favour of prepared foods is that there is a saving in the energy normally expended in biting, grinding, and digesting, and that this saving may be diverted to extra production.

This is only a half-truth. Nature has given every animal an efficient mechanism for digesting and assimilating food and, if this intricate mechanism is, through the agency of man, prevented from functioning normally, it may not function as nature intended, with the result that the animal will not thrive as well as it should.

Under the modern system of selective breeding and intensive feeding it becomes necessary at times to convert some foods into more readily digested forms; but it must not be assumed that the success obtained with one class of animal, or one type of food, is applicable to all classes and types

European and American findings have been correlated with Australian experience and summarised for the benefit of livestock owners.

Beef Cattle.—Pasture fattening is the accepted method of preparing beef cattle for market. It appears likely that the fattening of some "chiller grade" steers on compartively small properties will become more general. This will involve the use of some concentrates and possibly silage. Corn-in-cob is the most economical method of feeding maize to "top off" steers.

Sheep.—Merinos, which represent the majority of Queensland's sheep population, are only fed with concentrates in times of stress. Fortunately sheep are extremely thorough masticators, and it is only with very hard grain that crushing is necessary.

With the cross breeds, or meat breeds, it rarely pays to prepare the food. An exception may be made of lucerne hay, which sheds its leaves readily and consequently involves a loss due to the selective feeding of the animal. It therefore pays to chaff lucerne hay so that a proper admixture of stem and leaf is assured and waste avoided.

Concentrates in compressed "cube" or "nut" form are often fed to sheep, and may be swallowed whole. They are rapidly disintegrated under the action of digestive juices, so that there is no need to treat them in any way.

Horses.—There is no need to prepare oats or corn in any way, but harder grain should be crushed. Soaking is rarely justified and only when soaking of very hard grain is cheaper than crushing.

Roughage may be chaffed for hard worked horses, stud animals, or animals being prepared for exhibition. It is quite unnecessary for idle horses.

Very fine foods are to be avoided. Milling by-products should be carefully incorporated in the bulky feed, and if dusty a little water—preferably sweetened with molasses—may be added.

When the Cart is Bogged.

One of the common experiences of farm life is to be bogged with a cart or dray, down perhaps to the axle. This is how to get over the difficulty. Take off the leader and hook him on to the wheel that is bogged. A chain, or some wire doubled and put round the spoke and over the tyre, fixed far enough back to give a good pull, is sufficient for the job. Tie well back past the top of the wheel, about three quarters of the way up the other side, so that the first strain will be at such an angle as to pull forward without any chance of slipping. Stand the team up to a pull together, and this will give all the extra purchase needed to lift the wheel clear. If the wheel should happen to slip, tie a piece of wood to the bottom of the wheel or strap a piece of timber to a spoke to act as a grip to lever against.

Fat Lamb Production.

Gratifying results have followed the scheme initiated by the Minister for Agriculture and Stock with the object of stimulating the production of fat lambs. Rams of British breeds, comprising Border Leicesters, South Downs, Dorset Horns, Shropshires, and Romney Marsh, were purchased in the South and distributed to farmers who had cultivation available, or who were prepared to cultivate. In certain cases in which a farmer owned a stud ram of a particular breed, stud ewes were supplied with the idea of fostering the breeding of pure stock. All sheep supplied to farmers are on loan, and remain the property of the Department The progeny and wool, however, become the property of the farmers concerned.

The greatest drawback to the production of fat lambs on the Darling Downs in quantity has been, and still is, the difficulty of purchasing good crossbred ewes as the mother flock.

If a start has to be made with merinos the best ewe for fat lamb raising is bred by the introduction of one of the long wools, such as Border Leicester, Lincoln or Romney Marsh into the strong-woolled, robust type of merino ewe. The ewe lambs of this drop should then be retained as the future dams of the lamb-raising flock.

As to suitable ewes for the fat lamb industry, it is believed that graziers on the fringe of the Darling Downs or further out would find it profitable to join long-woolled rams of British breed with their cast-for-age ewes with the idea of selling the progeny annually as fat lamb ewes on the Downs. Into the crossbred ewe flock, as described, should be introduced a ram of the Downs type. Opinions necessarily differ in the matter of crosses. The South Down is the fashionable lamb at the present time, but it should be remembered that this cross must suffer no check from birth to block. The Dorset Horn gives a very nice lamb, early maturing and hardy. The use of the Border Leicester should be encouraged in every way. In addition to producing an early-maturing lamb that fills every want, it must be remembered that the skin value of this lamb is worthy of consideration to a far greater extent than either the Dorset or the South Down.

Purebred Corriedale ewes are hard to come by, but should the opportunity occur a farmer would be well advised not to let it slip. Pure Corriedales are hard to beat, good mothers and heavy milkers, besides growing a profitable fleece.

Generally, the wool from a flock retained for fat lamb breeding is a secondary consideration when compared with the production of fat lambs.

The Handling of Small Clips.

It is always a problem for the farmer who is running a few sheep to get full value for the wool he cuts. Hence the service given to farmers by the Department of Agriculture and Stock through the farmers' wool scheme. Should the number of sheep depastured enable a farmer to prepare correctly the bulk of his wool for market, he is advised to do so. Star lots and oddments should then be sent to the Department for classification, with the object of getting full market values.

An advance of 60 per cent., free of interest, of the estimated value of the wool, is made by the Department to growers running less than 1,500 sheep. In the meantime, the wools received are classed into large lots, where that is possible, thus meeting with full competition when placed on the market.

Should the bulk of the clip be prepared for market on the property, it is necessary that all fleeces should be carefully skirted and all stains removed. The classification of the fleeces calls for special knowledge and, if the farmer is not capable of doing it himself, he should employ a man competent for the work. A few pounds spent in the proper get-up of a clip may be regarded as economy, the farmer being more than recompensed for the outlay by the enhanced prices received.

If the farmer has insufficient sheep to make the services of a classer worth while, the Department is prepared to make the services of an officer available for instructional purposes on the property.

Lifting Pigs.

Sometimes a farmer has three or four pigs to be sent away on a lorry and has no loading race, thus making it awkward to load them. One man stands on the left and holds the pig's ear with his left hand while another stands on the right and holds the pig's tail with his left hand. Both must then grasp hands under the pig's chest near the front legs, and it is then an easy job to lift it into the lorry.

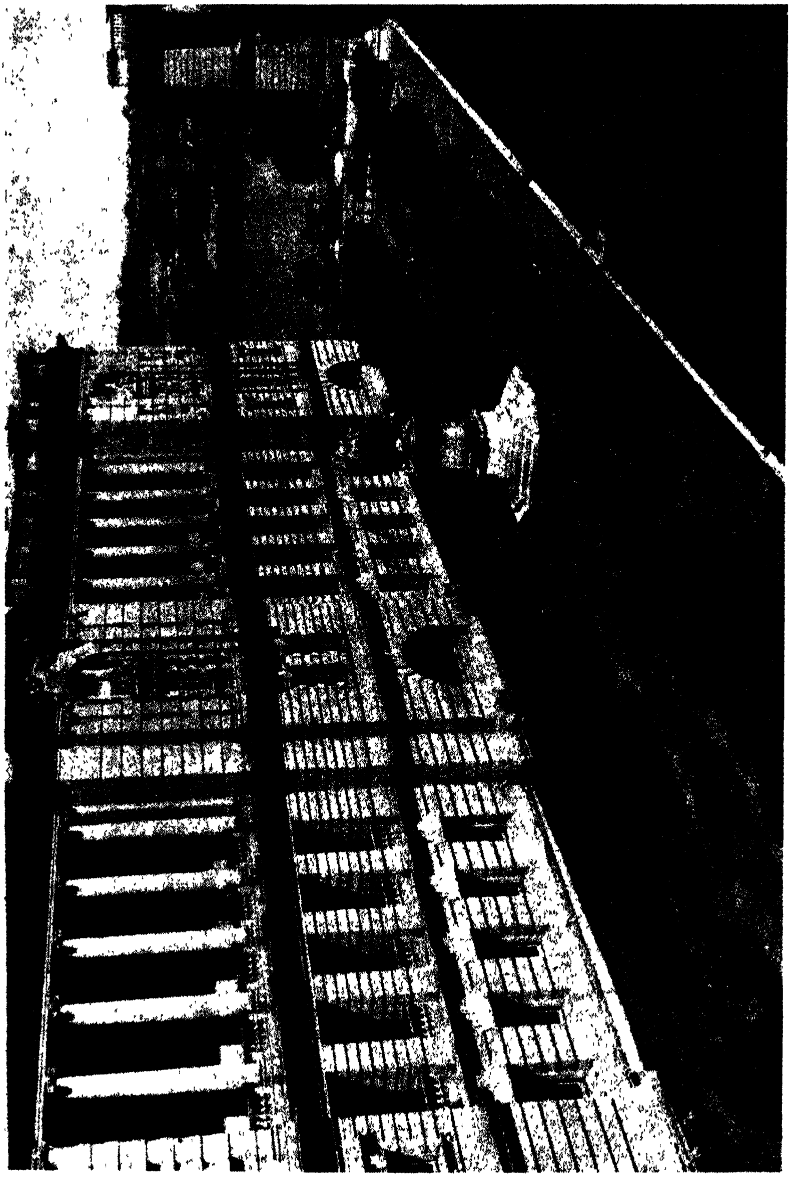


Plate 91.

A View of Queen's Gardens, Brisbane.

Showing the Executive Building and a glimpse of the Brisbane River beyond. The flower beds supply a blaze of gorgeous colouring the whole year round.

Orchard Notes

SEPTEMBER.

THE COASTAL DISTRICTS.

IN the North Coast and Gayndah districts the bulk of the citrus crops have been harvested with, perhaps, the exception of Valencia Lates. Orchard activities should be directed towards pruning, cultivation, fertilizing, and spraying. As a result of seasonal conditions there are numerous instances of trees showing signs of impaired vigour, and these will require a severe pruning both in thinning and shortening back, removing superfluous growths and diseased and weakly woods. Healthy and vigorous orange trees will require little attention beyond the removal of crowded lateral growths.

Mandarins will need special treatment, particularly Glen Retreats and Scarlets. These varieties usually produce a profusion of branches, and as the trees mature the growths harden and the fruit-bearing shoots make short, weakly growths, which generally results in an over-production of small fruits and a weakening of the trees. This is particularly noticeable in the case of the former variety. Here the annual pruning should consist of a heavy thinning and shortening back. Mature mandarin trees require attention towards assisting them to produce new and vigorous fruit-bearing growths.

Unprofitable trees should receive attention and be prepared for top-working. They may be headed back to three or four main arms radiating from the stem and whitewashed to prevent bark scald. Such trees may be grafted or later budded when suitable growths have matured.

Prior to working up the soil fertilizing should receive attention. The spring application should carry a high percentage of nitrogen.

In the warmer districts which are free from frosts plantings of young trees may be made. Serious consideration should be given to the selection of commercial varieties only, and, having due regard for local conditions, selections may be made from the following varieties:—Washington, Navel, Joppa, Siletta, Valencia Late, Beauty of Glen Retreat, Emperor, Scarlet, Solid Scarlet, Marsh Seedless or Thompson grapefruit, and Villa Franca, Lisbon, and Genoa lemons.

Where Melanose and Black Spot are present in orchards preparations for control measures should be made, and Bordeaux sprays applied at the correct times.

The majority of citrus trees would be considerably benefited by the application of a strong lime-sulphur wash, 1-18.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

BLACK aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbourage for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

Plate 92.
Daggs Falls, near the Spring Creek Road, at Killarney.

Farm Notes

SEPTEMBER.

WITH the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghum, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Early maturing varieties so-called "90 Day," are preferable for spring sowings, as they will make the best use of the moderate rains usually received during the early summer months. Inter-row cultivation is important, checking weed growth and maintaining the surface soil in a friable condition.

Although cotton may be sown this month, it usually stands a better chance if deferred until October, when the warmer temperatures allow of the obtaining of better germination and promote a healthier growth of the resultant seedlings. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Peanuts, sweet potatoes, arrowroot, cow cane, and in those districts suited to their production yams and ginger. Plant out coffee.

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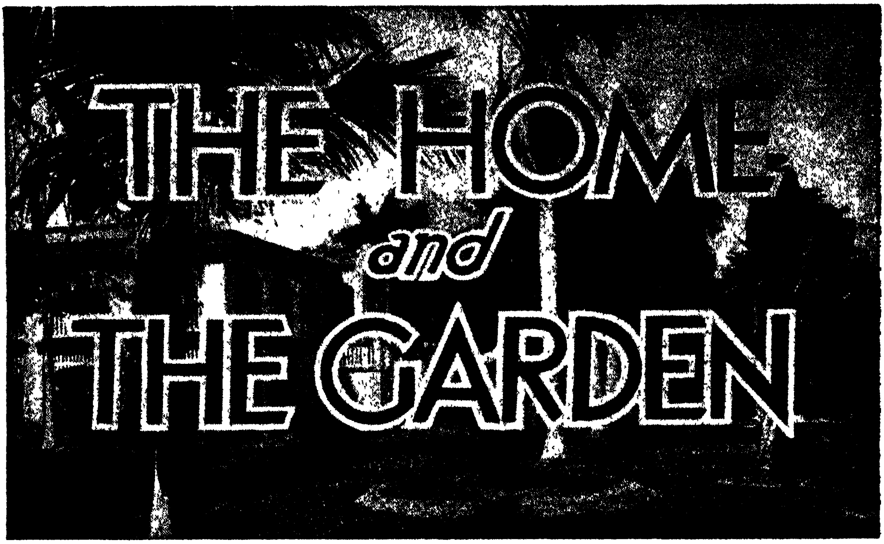

OUR BABIES.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

REST AND SLEEP.

THE newborn baby normally sleeps nine-tenths of its time, and at six months two-thirds of its time. The baby should be trained to sleep at the same time every day and all night. The habit of sleeping peacefully is one of the clearest evidences of sound health. Normal, healthy babies should be trained from the beginning to have no night feeding. This ensures an undisturbed night's rest to the mother, and establishes the baby in his proper rhythm from the start, saving him from the period of irritability, disturbed rest, and slackening of growth incidental to the breaking of a bad habit a few months later. Why break in on the night's rest? Why impart any tendency to insomnia at the start of life? Happy is the baby who sleeps all night from the dawn of existence.

It is well to continue the morning rest until the child is three or four years old, especially during summer, when children wake early. Even if the child does not sleep, the habit of resting is of great value. A short rest, or sleep, restores a child wonderfully, and the result is that there is no crossness or fatigue at the end of the day.

In forming good habits of rest and sleep, regularity is necessary. Do not pick the baby up when he cries at night. However, the mother should make sure that the baby is quite dry; that he is not suffering from wind; and is quite snug and comfortable. It is possible to change the baby's napkin without waking him.

The baby should be trained as soon as possible to sleep during the hours when the mother is busiest with her household duties. He will then take a long sleep during the morning, stay awake for an hour or two, and take a long nap in the early afternoon. As baby grows older he should not be encouraged to have a long sleep in the late afternoon, as he then will not be ready to go to sleep after the evening meal (5.30 to 6 p.m.). A late afternoon sleep also interferes with the early afternoon outing. It would be a great advantage to the entire household, apart from the health and benefit accruing to the child, if young mothers would contrive to have the baby and younger children asleep in bed before the father arrives home for the evening meal. Never play with and excite a baby just before bedtime. While natural mothering and moderate handling is beneficial, injudicious or excessive handling or stimulation is highly injurious.

OVERSTRAINED BABIES SLEEP BADLY.

Children are fond of babies and never tire of stimulating their funny performances. This should not be permitted. Unfortunately, some parents and friends are just as foolish in amusing themselves at the expense of the baby. A little gentle stimulation by the mother may be harmless, and even beneficial, to some babies. Continual stimulation (especially before bedtime) spoils their sleep, upsets their nutrition, and makes them nervous and irritable. This is giving them a very bad start in life, and may have undesirable consequences in the future.

Some parents are in the habit of taking their children, and even their babies, out with them in the evening, shopping or visiting. In some instances there is no one with whom they can be left, but baby's welfare should always be considered first. It is worse still to take them to the cinemas, where they become overtired or over-excited, and are exposed to the great risks of infection with influenza, catarrhs, and other diseases, leading perhaps to pneumonia or abscess in the ears.

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HOW MUCH TO EAT.

(Contributed by the Queensland Nutrition Council).

"LIVE to eat!" or " Eat to live!"—which shall it be? As is the case with so many vexed questions, neither extreme is correct. Would you call normal the man who gulps down a few mouthfuls of food placed before him by an insistant wife, with no thought for its delicacy or method of serving? Do you, on the other hand, really envy the man who turns every meal into a feast, rising with disappointment, and some difficulty, when the last available particle has disappeared, to seek in repose an opportunity for overworked nature to catch up in the eternal competition? Most assuredly you do not envy either of these extreme individuals. " Moderation in all things and all things in moderation," should be one's motto in eating, as in all the necessities and pleasures of life.

The Appetite.

Scientists will tell you that hunger is accompanied by contractions of the muscular stomach wall, and that these contractions are associated with the secretion of adrenalin from one of the ductless glands. This in turn may be due to a falling level of sugar in the blood. The whole mechanism is very complicated, and appetite is not exactly the same as hunger. Every normal person should experience appetite, but only the starved person, should feel real hunger.

We all know what appetite is and the normal variations to be expected, though they are difficult to define. Appetite may become abnormal in three ways—(i.) lessened (ii.) increased (iii.) perverted. It should be the aim of every person to keep the appetite within normal limits by neither denying nor satiating it. If, in spite of this reasonable behaviour, it persists in being abnormal, there must be a cause, and the cause must be found. The person to do that is your doctor.

The chief causes of lessened appetite are:—

Worry.—A very common cause, especially in women, but also in men.

Irregular eating as indulged in by the housewife who "picks" between meals, the school-child spending his pennies on sweets, and the busy man who "just cannot be bothered."

General loss of condition from overwork, lack of exercise, loss of sleep, etc.

Ill-balanced diet.—Diet which continues to contain a deficiency of some necessary item (especially vitamin B) very often leads to a loss of appetite.

Gastric abuse.—The continued use of food or drink irritating to the stomach, e.g., chronic over-indulgence in alcohol, will impair the appetite.

Gastric diseases of various kinds affect the appetite. If there is any reason to suspect these, the doctor should have the earliest opportunity of finding this out.

General disease, even a cold will impair the appetite. In such cases it is not wise to force it too enthusiastically.

The way to correct diminished appetite is not to force unwelcome food in blank defiance of the body's desires, but to set about finding out why the appetite is poor. *One should examine one's eating habits candidly and firmly.* Only too often the habits are entirely at fault. The importance of doing this early is not merely the restoration of a pleasant bodily function but the prevention of actual digestive disease. Loss of appetite, "indigestion," distaste for food are often friendly warnings that the digestive apparatus is being ill-treated. If they are ignored, actual disease frequently develops. If there is any doubt at all on the matter, particularly if no fault can honestly be found with the eating habits of the individual, a medical man should be consulted, especially if the sufferer is getting on in life.

Increased Appetite.

A definitely increased appetite occurs in some diseases such as exophthalmic goitre and diabetes. Apart from this, however, many people feel that they ought to eat much more than they really need.

This is particularly so with sedentary workers at or past middle age. As that indefinite though real period known as "the prime of life" is passed, creature comforts come to appeal more and more; the spartan recklessness of youth dies away and pleasurable indulgence appears to be more man's desire. Of those comforts, eating is one of the foremost. Coupled with this development is often a growing disinclination for active exercise. True, golf, bowls and other pastimes are designed to supply this exercise, but they are poor substitutes for the spontaneous activity of youth. Thus it is that those who have never been worried by the lack of appetite become a prey to the insidious fault of over-eating in middle age. For such as these, moderation is more than a motto, it is a necessity.

In advocating moderation or a restriction of food for middle-aged people of sedentary habit, there is no desire to condone neglect of eating or to close one's eyes to the undesirability of a poor appetite, any more than in earlier life. The moderation which is practised should be an all-round restraint and not the faddist's exclusion of a particular food. Modern science knows no reason why "red" meats should be prohibited while "white" meats should be permitted. Modern science knows no reason why proteins and carbohydrates should be regarded as incompatible, and excluded from the privilege of combining in a meal. Modern science *does* realize, however, that most people, and especially those of the earlier generations, eat far too little of such foods as fruit, milk, and vegetables. For that reason it is suggested that the restriction of the "over 40" diet should commence with the other articles of diet, especially those containing a preponderance of the highly-refined foods.

Effects of Over-eating.

Over-indulgence in almost any form (including over-indulgence in work) is one of the predisposing causes of high blood pressure. Over-eating is an important factor in the causation of diabetes, gout and other kindred disorders. Even if these definite diseases are not developed (because other things than over-eating must be acting), a state of impaired health and decreased efficiency must result. The tendency to drop off to sleep after lunch is sometimes due to this. A certain laxity of mind is normal after a meal, but drowsiness is abnormal. Increasing girth in middle age is partly due to over-eating, although other factors enter in here, such as the balance of the ductless glands and loss of muscular tone. Digestive disorders are certainly encouraged by eating too much, especially too much of the highly refined foods.

Slimming.

To reduce weight is a modern fad. For people who become over-weight by reason of obvious over-eating, a reduction of food and a consequent reduction of weight is reasonable enough. Apart from this, however, especially in younger people, slimming is a bad and often dangerous practice. People are not all cast in the same mould—thank goodness! There are people who, for one reason or another, remain slim and are perfectly healthy. For those people to fatten up, a change in their make-up or definite over-eating would be necessary. Similarly, there are naturally stout people, and for these to "slim" necessitates a process of starvation. Many are the disasters to be attributed to this bad practice, not the least of which is predisposition to tuberculosis. There is one rule which these people who wish to reduce might bear in mind—the minimum amount of weight for a given diet is gained if the diet is perfectly balanced. A maintenance diet, perfectly balanced, is the minimum amount of food that can be taken with safety.

Dietary Rules.

1. If your appetite is normal, treasure it and do not abuse it by neglect or by gorging. Avoid conditions which might interfere with your digestion.

2. If your appetite is poor, examine your eating habits carefully and put them right. If the appetite is still poor, consult a medical man.

3. If you are at all worried about your appetite, consult your doctor.

4. If you are past middle age, and engaged in sedentary work, ask yourself frankly if you are eating too much. If so, reduce the quantity a little and see if you feel any better for it.

5. Do not be misled by single idea enthusiasts. There is no royal road to health, there is only a guiding principle—moderation!

6. It is safer to be over-weight under thirty-five and under-weight over thirty-five.

Plate 93.

JACQUELINE.—A little Queenslander of the cattle country of the South-West.

IN THE FARM KITCHEN.

CURRIES FOR COLD DAYS.

A Simple Curry.

Take ½ small apple, ¼ onion, 1 oz. margarine, 1 teaspoonful curry-powder, 1 teaspoonful curry-paste, 1 dessertspoonful flour, ¾ pint stock, 1 tablespoonful coconut, ¾ lb. cooked meat, 3 oz. boiled rice, chutney.

Place the coconut in the stock and allow it to soak. Chop the apple and onion finely, and fry in the margarine till slightly browned. Add the curry paste and powder. Strain off the coconut and add the stock, then simmer gently from thirty to forty-five minutes, then add the meat cut into dice. Blend the flour to a smooth paste and add it to the mixture. Stir till boiling, place the lid on the saucepan, and keep under boiling point from ten to fifteen minutes. Dish inside a border of boiled rice. Serve with chutney.

Curried Mushrooms.

Take ½ lb. small mushrooms, 1 hard-boiled egg, 1 dessertspoonful curry-powder, ½ oz. flour, 1 oz. butter, juice ½ lemon, 1 gill milk, ½ onion, salt, 3 oz. rice.

Peel and wash the mushrooms, and remove the stalks. Chop the onion and egg. Fry the onion and mushrooms gently in the butter for five minutes. Put the mushrooms on a plate. Mix the curry-powder and flour with the butter and fried onion and add the milk gradually. Stir it till it boils, and add the egg, salt, and lemon juice. Place the mushrooms in a double saucepan and pour the sauce on to them, leaving them for thirty minutes or till tender. Wash the rice and boil it for fifteen minutes in fast-boiling water. To serve, heap the rice in the middle of a hot dish with the mushrooms round it.

Farmhouse Curry.

Take 1 dessertspoonful curry-powder, ½ pint stock or water, ½ lb. cold meat, 1 dessertspoonful flour, 1 tablespoonful apple chutney, 2 tablespoonfuls cream, salt, 1 onion, 1 apple, milk, 1 oz. dripping, lemon juice, boiled rice.

Chop the meat, removing all gristle. Melt dripping, and when smoking hot fry onion, flour, and curry-powder together for a few moments, stirring all the time. Add chopped apple, salt, and stock or water. Stir carefully till sauce is smooth and boiling, then simmer for half an hour. Add meat, thin with milk, add chutney, and bring again to the boil. Just before serving, stir in a few drops of lemon juice, then cream, and serve surrounded with boiled rice.

Curried Lamb Casserole.

Take 1¼ lb. neck of lamb, 1 teaspoonful curry-powder, 1 teaspoonful flour, ½ lb. carrots, seasoning, 4 small onions, ½ lb. potatoes (new if possible), cold water.

Scrape or peel potatoes, scrape carrots, and boil in salted water till tender. Peel the onions and boil till tender separately. Drain the vegetables, cut potatoes and onions in half, and slice the carrots. Simmer the meat till tender in boiling water. Remove from the pan and cut into pieces. Mix the curry-powder and flour to a paste with a little cold water and add about three-quarters of a pint of the liquor the meat was boiled in. Mix till smooth and add seasoning. Put the meat and vegetables in a casserole. Pour the curried stock over. Cover and bake in a fairly hot oven for half an hour.

Curried Bananas.

Take 3 oz. rice, 4 bananas, ½ oz. margarine, ½ oz. flour, ½ apple, ½ onion, 1 teaspoonful curry-powder, 1½ gills water, juice ½ lemon, 2 hard-boiled eggs, 1 teaspoonful salt.

Wash the rice and boil it for fifteen minutes with the salt in plenty of fast-boiling water. Boil the eggs for ten minutes, put them in cold water, and remove the shells.

To make the curry sauce, peel and chop the apple and onion, and fry them in the margarine for five minutes. Stir in the flour, curry-powder, lemon juice, and a pinch of salt, and add the water gradually. Stir the sauce till it boils, lay the skinned bananas in the sauce and heat them for about five minutes. Add a little more water if necessary. Strain the rice into a colander and grate the onion on to it. Do not mash the rice. If it is boiled for exactly the right time each grain will be separate. Heap the rice on a hot dish with the bananas and sauce round, and garnish with quarters of hard-boiled egg.

Bengal Curry.

Take 1 oz. butter or margarine, 1 small onion, 1 dessertspoonful curry-powder, ¼ to ½ pint milk, ½ lb. rice, ½ lb. uncooked or any left-over meat will do.

Cut the onion into slices and put into a saucepan with the butter. Fry until browned, then add the curry-powder and mix well. Pour in the milk and mix thoroughly with the curry. Cut the meat into pieces about an inch square, add to the saucepan, and allow to simmer for about twenty minutes. Turn into a flat dish and serve with a border of boiled rice, piping hot.

Note: Be sure to fry the curry-powder well in butter or margarine before the liquid is added, which turns it into a sauce. Then simmer until all the ingredients are well mixed.

Curried Vegetable Patties.

Take 1 cupful of any cold vegetables, 1 oz. sultanas, 1 onion, ½ oz. flour, 1 gill water, ½ gill vinegar, ½ oz. curry-powder, ¼ teaspoonful salt, parsley, 3 or 4 slices stale bread about two inches thick, ¾ oz. butter, deep frying fat.

Mince the onion and fry it in the butter for five minutes. Stir in the flour, curry-powder, and vinegar. Add the water and sultanas and stir till boiling. Season to taste. Chop the cold vegetables and add them to the sauce. Keep them hot on a very low gas while making the fried bread-cases.

To make the cases, cut the bread into rounds and scoop out the centre. Fry one at a time in smoking hot fat for about three minutes, turning them over when one side is done. They should be a golden brown. Drain them on paper and fill with the hot vegetable mixture. Serve on a lace paper and garnish with parsley.

Madras Curry.

Take 1 good-sized onion, 4 oz. desiccated coconut, ½ oz. butter, 1 dessertspoonful curry-powder, ½ apple, a strip of lemon peel, 2 or 3 cloves, 6 oz. rice, ½ lb. lean uncooked meat.

Pour a large teacupful of boiling water over the grated coconut, allow to stand for a little while, then strain off the milk and set by. Cut the onion into slices and fry in the butter until browned. Fry the curry-powder, and add half the coconut milk, mixing all well together. Add half of an apple, peeled and cut into slices, a strip of lemon-peel (this should be taken out when served), and two or three cloves. Cut the meat into small pieces, stir into the mixture, and allow to simmer for about two hours. Before serving add the remainder of coconut milk. Turn on to a flat dish and serve with a border of boiled rice.

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THE DIPPING OF CATTLE.

The dipping of cattle is sometimes treated casually in tick-infested areas and this is not infrequently the cause of an unsatisfactory clean up, and also of ill effects on the stock such as scalding.

Cattle should be quietly driven to the dip and allowed to cool down in the yard before they are passed through the dipping fluid. "Rushing" is both unnecessary and undesirable. Cattle often tend to race back to the farm after treatment, but they should always be steadied down to a moderate pace.

Dairy cows are particularly susceptible to scald in the udder, and injuries of this type frequently lead to difficulties in milking. Scalding is often attributed to too strong a dipping fluid; but the real trouble is more often the failure of the farmer to grease the sensitive parts of the udder before the cows leave the farm for the dip.

All the ticks may not be killed at one treatment, even when the dipping fluid is of standard strength. Ticks in the process of moulting may survive while travelling stock sometimes accumulate sufficient dirt and grime in the heavy winter coat to protect some of the more sheltered pests. Nevertheless, where reinfestation is not heavy, properly tended cattle should not be troubled by ticks for some time after dipping and the farmer cannot afford to neglect the only known method of coping with the pest.

J. Gunn, Stock Branch.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and stations.	Average Rainfall. June.	Average Rainfall. No. of years' records	Total Rainfall. June, 1937.	Total Rainfall. June, 1936
North Coast	In.		In.	In.
Atherton ..	1·69	36	0·25	3·96
Cairns .. .	2·90	55	0·30	8·12
Cardwell	2·04	65	0·83	2·82
Cooktown .	2·02	61	0·03	4·29
Herberton ..	1·17	51	0·07	2·68
Ingham	2·41	45	1·51	4·50
Innisfail .. .	7·28	56	3·19	13·64
Mossman Mill .	2·53	24	0·70	9·56
Townsville	1·38	66	0·75	4·90
Central Coast				
Ayr . .	1·50	50	0·48	5·37
Bowen .	1·65	66	1·54	5·66
Charters Towers	1·32	55	1·90	5·23
Mackay ..	2·74	66	1·88	10·31
Proserpine	3·41	34	1·56	11·44
St. Lawrence .	2·51	66	1·40	6·39
South Coast				
Biggenden	2·25	38	0·92	5·48
Bundaberg	2·88	54	1·26	5·23
Brisbane .	2·71	85	0·73	1·90
Caboolture	2·68	50	1·14	2·17
Childers . .	2·49	42	0·79	3·90
Crohamhurst	4·48	44	1·74	4·57
Esk	2·22	50	1·16	2·02
Gayndah ..	1·83	66	0·72	3·67
Gympie ..	2·68	67	1·21	3·65
Kilkivan ..	2·12	58	1·16	3·47
Maryborough .	3·02	66	1·63	4·61
Nambour ..	3·75	41	1·94	4·86
Nanango .	1·98	55	1·29	2·13
Rockhampton	2·59	66	1·60	4·67
Woodford . ..	2·89	50	1·51	2·57
Central Highlands	In.		In.	In.
Clermont	1·68	66	1·70	2·51
Gindie	1·45	38	..	1·63
Springsure	1·77	68	0·92	1·91
Darling Downs				
Dalby ..	1·67	67	1·04	1·56
Emu Vale	1·50	41	0·78	1·27
Hermitage .	1·75	31	.	1·82
Jimbour ..	1·65	49	0·79	0·70
Miles .	1·77	52	0·68	1·29
Stanthorpe	1·90	64	1·33	1·27
Toowoomba	2·38	65	1·19	1·64
Warwick	1·74	72	0·68	1·68
Maranoa				
Roma .	1·57	63	0·50	1·29
State Farms, &c.				
Bungeworgorai	1·30	22	..	1·26
Gatton College .	1·82	38	0·82	1·96
Kairi . .	1·46	21	..	..
Mackay Sugar Experiment Station	2·50	40	1·57	9·90

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Shade Temperature. Means. Min.	Shade Temperature. Extremes. Max.	Shade Temperature. Extremes. Date.	Shade Temperature. Extremes. Min	Shade Temperature. Extremes. Date	Rainfall. Total.	Rainfall. Wet Days.
Coastal.	In.	Deg.	Deg.	Deg		Deg		Points	
Cooktown	29·95	78	66	85	4	54	25	3	1
Herberton	.	73	49	80	14, 15	32	21, 23	7	4
Rockhampton	30·06	72	52	83	13	41	3	160	5
Brisbane	30·07	67	51	71	13	43	30	73	8
Darling Downs.									
Dalby	30·10	64	40	72	9, 10	27	2	104	9
Stanthorpe	..	57	34	65	10	18	3	133	13
Toowoomba	..	60	41	66	13	24	17	119	6
Mid-Interior.									
Georgetown	30·00	81	51	90	13	34	21	Nil	..
Longreach	30·10	71	43	80	9	34	2	79	5
Mitchell	30·13	65	36	74	10	23	2	110	4
Western									
Burketown	30·02	80	55	89	14	44	22	Nil	..
Boulia	30·12	70	46	77	13	40	2, 3, 6, 7, 27, 28	89	2
Thargomindah	30·12	64	41	75	9	29	2	51	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August. 1937.		September. 1937.		MOONRISE. Aug. 1937.	MOONRISE. Sept. 1937.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.35	5·21	6·7	5·37	1·4	2·56
2	6·34	5·22	6·6	5·37	2·8	3·45
3	6·33	5·23	6·5	5·38	3·11	4·27
4	6·33	5·24	6·4	5·38	4·9	5·6
5	6·32	5·25	6·3	5·39	5·2	5·43
6	6·31	5·25	6·2	5·39	5·51	6·19
7	6·31	5·26	6·1	5·40	6·33	6.54
8	6·30	5·26	5·58	5·40	7·11	7·29
9	6·29	5·27	5·57	5·41	7·47	8·6
10	6·28	5·27	5·56	5·41	8·22	8·46
11	6·28	5·28	5·55	5·42	8·56	9·26
12	6·27	5·28	5·53	5·42	9·32	10·10
13	6·26	5·29	5.52	5·43	10.9	10·59
14	6·25	5·29	5·51	5·43	10·50	11·51
						p.m.
15	6·24	5·30	5·50	5·44	11·31	12·46
					p.m.	
16	6·23	5·30	5·49	5·44	12·17	1·40
17	6·22	5·31	5·48	5.45	1.7	2·37
18	6·21	5·31	5·47	5·45	2·0	3·36
19	6·20	5·32	5·45	5·45	2·56	4·35
20	6·19	5·32	5·44	5·46	3·52	5·34
21	6·18	5·33	5·43	5·46	4·49	6·36
22	6·18	5·33	5.42	5·47	5·49	7·30
23	6·17	5·33	5·41	5·47	6·48	8·48
24	6·16	5·34	5·40	5·47	7·48	9·54
25	6·15	5·34	5·39	5·48	8·48	10·56
26	6·14	5·35	5·38	5·48	9·52	11·58
27	6·13	5·35	5·37	5·49	10.56	—
						a.m.
28	6·12	5·36	5.36	5·49	..	12·52
					p.m.	
29	6·11	5·36	5·35	5·50	12·2	1·40
30	6·10	5·37	5·34	5·50	1·4	2·24
31	6·9	5·37			2·3	

Phases of the Moon, Occultations, &c.

6 Aug.	●	New Moon	10 37 a.m.
14 ,,	☾	First Quarter	12 28 a.m.
22 ,,	○	Full Moon	10 47 a.m
29 ,,	☽	Last Quarter	9 55 a.m.

Perigee, 3rd August, at 2 p.m.
Apogee, 15th August, at 1 p.m.
Perigee, 29th August, at 1 p.m.

On the morning of the 4th Venus, the beautiful Morning star, will be seen near the waning Moon.

Mars, whose movements have been watched with interest for some months will on the 15th again be in the head of the Scorpion as at the beginning of April. On its journey eastward through the narrow part of Orphincus it will pass the brightest stars in Scorpion.

Jupiter, the most brilliant object in the evening sky, appears high in the east after sunset Apparently moving westward it will on the 28th be near the brightest stars in Sagittarius. It is now more than two million miles nearer the Earth than it was in the middle of July when, at its nearest, a distance of nearly 600 million miles separated us from the giant planet.

Saturn, rising about 9 30 p.m at the beginning of the month and about two hours earlier at the end, will be found almost in line with the two stars forming the eastern side of the Great Square of Pegasus.

Mercury rises at 7.49 a.m., 1 hr. 14 min. after the Sun and sets at 7.1 p.m , 1 hr. 40 min. after it on the 1st; on the 15th it rises at 7.41 a.m., 1 hr. 40 min. after the Sun and sets at 7.35 p.m., 2 hr. 5 min. after it.

Venus rises at 3.40 a.m., 2hr. 55 min. before the Sun and sets at 2.14 p.m., 3 hr. 7 min. before it on the 1st; on the 15th it rises at 3.52 a.m., 2 hr. 32 min. before the Sun and sets at 2.28 p.m., 3 hr. 2 min. before it.

Mars rises at 12.1 p.m. and sets at 1.39 a.m. on the 1st; on the 15th it rises at 11.28 p.m. and sets at 1.16 a.m

Jupiter rises at 3.53 p.m. and sets at 5.33 a.m. on the 1st; on the 15th it rises at 2.50 p m. and sets at 4 36 a.m.

Saturn rises at 9.33 p.m. and sets at 9.41 a.m. on the 1st; on the 15th it rises at 8.35 p.m. and sets at 8.14 a.m.

The Southern Cross will be on its downward path towards the west, accompanied by two of the finest constellations, the Centaur and Argo, the Ship; but in the north-east the Northern Cross has arisen, part of the constellation Cygnus, the Swan, which with outstretched wings is flying upwards.

5th Sept.	●	New Moon	8 54 a.m.
13th ,,	☽	First Quarter	6 57 a.m.
20th ,,	○	Full Moon	9 32 p.m.
27th ,,	☾	Last Quarter	3 43 p.m.

Apogee, 12th September, at 8 a.m.
Perigee, 24th September, at 7 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick, at Goondiwindi, add 8 minutes, at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate; as the relative positions of the sun and moon vary considerably.

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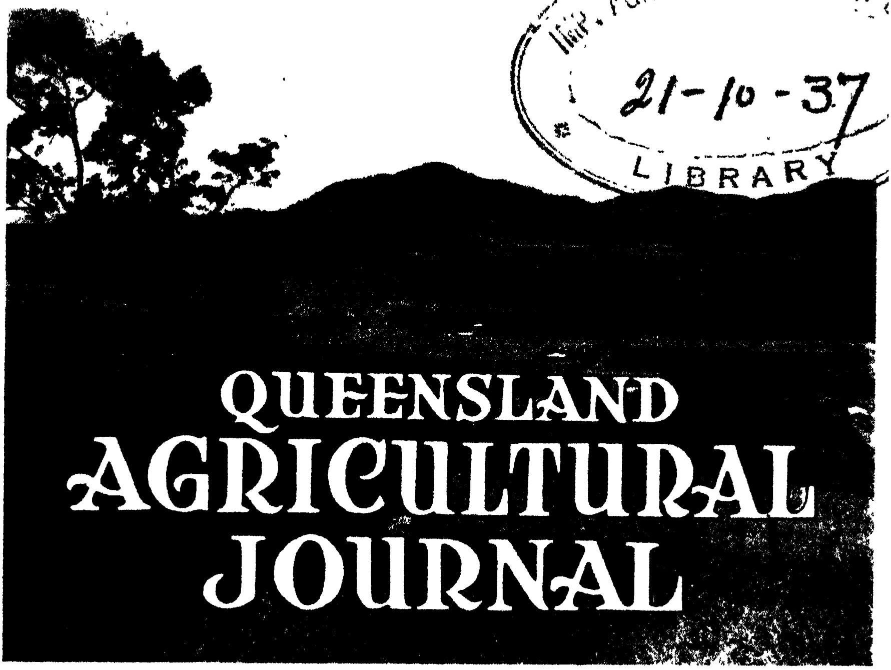

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XLVIII. 1 SEPTEMBER, 1937. PART 3

Event and Comment

The Australian Agricultural Council.

AMONG the outstanding events of the month was the meeting in Brisbane of the Australian Agricultural Council, which was attended by the Commonwealth Minister for Commerce and the Ministers for Agriculture of every State. The conference was the most important held since the Council was constituted several years ago. Reviewing its decisions, the Queensland Minister, Hon. Frank W. Bulcock, said that the motive underlying the formation of the council had been the unification of research and the provision of a common approach to economic and agricultural problems.

Three of the decisions were of outstanding interest. The council affirmed that water conservation was a national and not a State matter, and that the necessary inquiry should be made to elevate this question to one involving the co-operation of all the Governments. Allied to this was the problem of fodder conservation, which naturally would follow a sound water policy.

Secondly, the council affirmed its opposition to quotas and to the restriction of production, and expressed a desire that its opinion as the highest deliberative agricultural body in Australia should be sent to the appropriate authorities.

In the third place it declared for co-ordination of research services in relation to stock diseases, and made provision for summoning departmental representatives of the States to lay down a programme for disease prevention and eradication, with special reference to contagious disorders.

The Queensland Council of Agriculture.

ANOTHER important event in August was the annual conference of the Queensland Council of Agriculture, the executive body of the Queensland Producers' Association. The President, Hon. Frank W. Bulcock, in opening the conference, said that economic security was one of the fundamentals of rural organisation. "I am speaking," he continued, "to the farmers of the State through their farmers' parliament. If the farmers realise that the Queensland Producers' Association has the capacity to do things, has the capacity to make representations, and has not only the ear of the Government but also the imprimatur of the Government, I think that talk about the formation of a conflicting organisation that cannot achieve any more than this organisation can achieve, but, on the contrary, will handicap, to a degree, the operations of the organisation by dissipating its energy and total forces, will cease."

Going on to discuss the problems of agriculture generally, Mr. Bulcock added that definite progress had been made during the year in examining and determining the values of available water supplies for water conservation and irrigation. That work had progressed very satisfactorily, and side by side with it a Government committee had been working with representatives of his department, examining every aspect of water conservation and fodder conservation, particularly fodder conservation. This committee had done some remarkably good work.

As Minister for Agriculture, he regarded efficiency as one of the big things underlying all forms of agricultural work. "The people generally," he continued, "never express any resentment at farmer-control or producer-control, but they do say that there is an obligation on the part of the producer and allied interests, to give the Australian market the very best that they are capable of producing. I personally appeal to you to do all that you can to assist the home consumption price by giving the people the utmost efficiency in the production of the products that you desire to sell."

Organised Marketing.

ADDRESSING the delegates to the conference subsequently, Mr. Bulcock recalled his long association with the organisation, remarking that he was chairman of the Parliamentary Agricultural Committee at the time the original Act was before the Queensland Parliament, and that he had continued a sustained association with the entire industry ever since. To-day every country in the world was organising primary producers and tackling their problems along economic as well as cultural lines.

In spite of the opposition they sometimes encountered from inspired sources, neither the public nor the producer would be willing to sacrifice the advantage of organised marketing. The public generally did not realise that marketing boards in Queensland handled millions of pounds per annum, yet the cost of living was lower in Queensland than in any other State of the Commonwealth.

Antagonists so often declared that organised marketing increased the cost of living to the consumer; but rather did it seek to protect the public, and it had succeeded materially in affording the public that protection.

Mr. Bulcock referred to the resolution adopted by the Australian Agricultural Council, composed of Ministers for Agriculture of all the States, which met in Brisbane the same day, affirming its faith in and the necessity for a continuance of organised marketing. This, he said, was one of the most important achievements in regard to organised marketing since the judgment of the Privy Council.

Was it not surprising, the Minister went on, that farming was the only form of human endeavour that so often was denied the right to some form of organisation. The moral right must be greater than the legal right.

Mr. Bulcock added that he was convinced the time was past when there should be rapid changes in the personnel of pool boards. Instead of having a one-year tenure, pool boards should have not less than three years of office, and he hoped before long to have constituted every pool board for a three years' term. This was because he believed that continuity of policy was essential, and because no one could plan a policy and do justice to it and his organisation in one year.

The Romance of Sugar.

IN this issue is published a very interesting account of the development and progress of the Australian sugar industry. The annual report of the Bureau of Sugar Experiment Stations, which was tabled in the Legislative Assembly recently, is equally interesting as a record of contemporary progress in an industry which means so much to the Commonwealth.

No Australian industry is more important than cane sugar production, and, outside Queensland, few are so little known. Its special function in our national economy is not appreciated as widely as it should be. To it is due almost entirely the continued success and stability of the settlement of our tropical lands. Nearly forty per cent. of the area of this continent is situated north of Capricorn. In that vast region are some of our richest agricultural, pastoral, and mineral country. Through sugar, Australian population has increased at a greater ratio in the North than in any other portion of the Commonwealth. The wealth and progress of the thriving cities along the Queensland coast are based largely on sugar. Practically every secondary industry in the State depends on it in one way or another.

Every sugar mill is equipped with machinery made in Australian shops and foundries. Apart from fixed assets, in which many millions of good Australian money has been invested, there are recurring annual replacements of plant supplied by protected secondary industries. As a field for regular rural employment the sugar industry is one of the most extensive in Australia. Added to the vast army it employs in field and factory are the workers in the other industries that look to it as a profitable market for their products; the workers in the transport services; and the workers in the refineries, which are situated in every State capital.

Our sugar business therefore is something more than a simple sum in arithmetic; and the continuance of the industry on a satisfactory basis, and the consequent further development of our tropical lands, are among the bare essentials for the security of Australian hearths and homes.

Codling Moth Control Experiments, 1936-37.

HUBERT JARVIS, Research Officer.

THE need for a satisfactory substitute for lead arsenate in the control of codling moth has been apparent for a considerable time. Various alternative sprays and spray combinations have been used more or less successfully, but lead arsenate, which is both cheap and usually reasonably efficient, is still the most widely used insecticide for this purpose.

In the Stanthorpe district, experiments with non-arsenicals for the control of the codling moth were initiated in 1932 (Jarvis, 1933), and a nicotine sulphate-white oil spray then proved slightly more efficient than lead arsenate, though much more expensive. Subsequent work in the 1933-34 season (Jarvis, 1935) confirmed these experimental results, and also indicated that potash soft soap might have some value as a codling moth insecticide. In the 1935-36 season, the pest was very prevalent, and even where a lead arsenate spray schedule was conscientiously adhered to by the grower, fruit losses were considerable. Hence when the moths are very numerous, lead arsenate is by no means adequate and suffers the further disability that the numerous sprayings necessary, under such conditions, frequently leave undesirable residues which persist on the fruit until harvesting.

In the same season, i.e., 1935-36, it was noted that the addition of a contact insecticide to the lead arsenate spray gave beneficial results. This, in conjunction with the known properties of the nicotine sulphate-white oil combination suggested that further work on spray materials of a non-arsenical nature was justified. Additional evidence in support of this viewpoint was obtained on a plot used for fruit fly control experiments in 1935-36, as some of the sprays, e.g., colloidal sulphur-potash soft soap, incidentally gave quite good control of codling moth. The more promising of these sprays were used in comparative trials during the season 1936-37.

Experimental Material and Methods in 1936-37.

The experimental plot was situated in the Summit area, and comprised thirty apple trees of the Rome Beauty variety, distributed in a single row. The Rome Beauty is a late maturing variety subject to codling moth attacks over a relatively long period. Owing to the irregular incidence of frost damage in the orchard, the crop varied considerably from tree to tree, but the yield averaged two cases per tree.

The season was comparatively dry throughout, though heavy rains fell on and about 12th January.

The thirty trees were equally distributed among nine treatments and a check, allowing for three replications and general randomisation. The treatments were as follows:—

A. Bentonite sulphur-nicotine sulphate—2½ lb. bentonite sulphur: 1 pint nicotine sulphate: 80 gallons water: 2 oz. spreader.

B. Colloidal sulphur-nicotine sulphate—2½ lb. colloidal sulphur: 1 pint nicotine sulphate: 80 gallons water: 2 oz. spreader.

C. Commercial lime sulphur—1 gallon lime sulphur : 50 gallons water : 2 oz. spreader.

D. Commercial lime sulphur-nicotine sulphate—1⅝ gallons lime sulphur : 1 pint nicotine sulphate : 80 gallons water : 2 oz. spreader.

E. Thiodiphenylamine—2½ lb. thiodiphenylamine : 80 gallons water : 2 oz. spreader.

F. Nicotine sulphate-white oil—1 pint nicotine sulphate : 1 gallon white oil : 80 gallons water.

G. Potash soft soap*—10 lb. potash soft soap: 80 gallons water.

H. Lead arsenate—2½ lb. lead arsenate : 80 gallons water : 2 oz. spreader.

I. Colloidal sulphur-potash soft soap—2½ lb. colloidal sulphur : 10 lb. potash soft soap : 80 gallons water.

J. Control.

A spreader was used in all sprays other than those containing white oil or potash soft soap.

A lead arsenate calyx spray was applied to all trees other than the controls, the five cover sprays following as indicated in Table I.

TABLE I.

Spray	Date	Interval
		Days.
Calyx spray	21-10-36	
First cover spray	4-11-36	14
Second cover spray	19-11-36	15
Third cover spray	10-12-36	22
Fourth cover spray	4-1-37	25
Fifth cover spray	8-2-37	35
Fruit harvested	5-3-37	25

The experimental trees were kept under more or less continuous observation, windfall fruit being collected each week and examined for codling moth damage. Thus, at the completion of harvesting, every fruit borne by the trees had been inspected and records kept which indicated both the source of loss and, in the case of codling moth injury, the point of larval entry.

At the blossoming period the weather was unusually cold with low night temperatures. The spring brood of codling moths emerging from hibernating larvæ was consequently both late in appearance and comparatively low in numbers. Calyx infestation was small correspondingly, and the following figures indicate that, in fruit which is approaching maturity, grub entrances are mainly at the side and not at the calyx end of the fruit.

	Position of Larval Entry.	
Injured Fruits.	Calyx Entry.	Side Entry.
1,070	216 (20·1 per cent.)	854 (79·9 per cent.)

Spray Injury.

(*a*) *Attributable to Spreader.*

The fruit on all the trees treated with sprays in which a spreader was used showed surface spotting which was particularly severe in the case of

---

* The potash soft soap used in these experiments possessed the following analysis:—

	Per cent..
Fatty anhydrides	46.1
Alkali as Potash (K_2O)	10.4
Alkali as Soda (Na_2O)	.33
Alkali as free caustic	.05
Alkali as free carbonate	2.46
Glycerine	5.2
Water	38.3

thiodiphenylamine and lead arsenate. Comparable spotting was absent on trees treated with sprays devoid of the spreader and also on the controls. It would seem probable that the spreader was to some extent responsible for the damage.

The spots varied in size from 1 millimetre in diameter downwards and were quite superficial. As many as 100 occurred on some fruits, but the blemishes were not serious enough to prejudice the sale of the apples on the Australian market, though badly spotted fruit would not be suitable for export purposes.

The injury may be due to the exceptional qualities of the spreader having facilitated insecticidal penetration through the lenticels. Possibly greater dilutions of the spreader may eliminate the susceptibility of the fruit to spotting without impairing the spreading efficeucy of the several sprays to any great extent.

(*b*) *Attributable to lead arsenate.*

The trees in the experimental plot, which were treated with lead arsenate in both calyx and cover sprays, all showed signs of leaf scorch, and stood out distinctly from the rest of the plot on this account. Somewhat similar, though much less acute, injury was also noticed in trees sprayed with thiodiphenylamine. In the remainder of the orchard where the lead arsenate schedule was used, scorch was also present on all varieties of apples other than a few trees which, owing to the absence of fruit, were omitted from the spray treatment. Jonathans apparently suffered more severely than other varieties of apple.

During recent years leaf scorch has been increasing in severity in the Stanthorpe district. The trouble has been assigned to various causes, e.g., unfavourable growing conditions and nutrient deficiencies. At the same time the losses caused by codling moth have induced growers to increase not only the frequency but also the strength of the lead arsenate sprays used for the control of the pest. Observations during the current year indicate that in the Stanthorpe district, at least, the amount of lead arsenate required to effect reasonable control of codling moth may be harmful to the trees by producing some form of leaf scorch.

Discussion of Experimental Results.

In interpreting the tabulated results only major differences can be tentatively regarded as significant. Nevertheless, a number of the non-arsenicals gave control as good, if not better, than lead arsenate. Three of these non-arsenicals—bentonite sulphur-nicotine sulphate, colloidal sulphur-nicotine sulphate, and nicotine sulphate-white oil—all possess nicotine sulphate in common. Lime sulphur-nicotine sulphate would be expected to give results comparable with colloidal sulphur-nicotine sulphate, but a single tree, No. 19, in the former series suffered severe damage, and the weighted mean percentage of sound fruit for this treatment is consequently low. The habit of growth in this tree was such that effective spraying was almost impracticable, and it is probable that a repetition of the work would give better results with lime sulphur-nicotine sulphate.

The value of nicotine sulphate in the control of codling moth is further indicated by an examination of the results of the plots treated with lime-sulphur and lime-sulphur-nicotine sulphate. The other constituents in joint sprays containing nicotine sulphate may either supplement the latter by their own insecticidal properties or increase the period over which the nicotine sulphate is effective. Tests with the single and joint sprays in the one experimental scheme are necessary to determine this point.

TABLE II.

EXPERIMENTAL RESULTS.

Treatment.	Total Number of Fruits.	Number Attacked by Codling Moth.	Percentage Unattacked per Tree.	Percentage Unattacked per Treatment.	Approximate Cost per 40 Gallons.
					s. d.
A. Bentonite sulphur — nicotine sulphate .. .. .. Tree Nos. 1, 13, 21 ..	98 80 141	0 8 12	100 90 91·5	93·8	*
B. Collodial sulphur — nicotine sulphate .. .. .. Tree Nos. 2, 12, 25 ..	59 90 295	1 6 18	98·3 93·3 93·9	94·4	6 0
C. Lime sulphur .. .. .. Tree Nos. 3, 15, 23 ..	126 200 184	61 37 67	51·6 81·5 63·6	67·7	1 10½
D. Lime sulphur — nicotine sulphate .. .. .. Tree Nos. 4, 19, 27 .	58 258 128	7 105 7	87·9 59·3 94·5	73·2	5 2
E. Thiodiphenylamine .. . Tree Nos. 5, 18, 29 ..	219 284 186	38 92 30	82·6 67·6 83·9	76·7	*
F. Nicotine sulphate—white oil Tree Nos. 6, 20, 26 ..	74 350 407	2 3 9	97·3 99·1 97·8	98·4	6 1
G. Potash soft soap .. .. Tree Nos. 7, 11, 30 ..	97 241 98	5 2 2	94·8 99·2 98·0	98·0	2 0½
H. Lead arsenate .. .. Tree Nos. 8, 14, 24 ..	167 122 369	33 31 40	80·2 74·6 89·2	84·2	1 6
I. Colloidal sulphur—potash soft soap .. . .. Tree Nos. 9, 16, 28 ..	125 151 118	2 7 3	98·4 95·4 97·5	97·0	4 4
J. Controls. .. .. .. Tree Nos. 10, 17, 22 ..	269 344 208	135 154 153	49·8 55·2 26·4	46·2	——

*Not available.

Spray costs based on the following prices:—

	s.	d.	
Lead arsenate	1	0	per lb.
Lime sulphur	9	0	per 5-gallon tin.
Colloidal sulphur	5	6	per 3 lb.
Potash-soft soap	2	10	per 7 lb.
Nicotine sulphate	27	6	per ½ gallon.
Spreader	3	10	per lb.

A second group of sprays, potash soft soap and colloidal sulphur-potash soft soap, gave excellent results in controlling the pest. The value of potash soft soap is somewhat difficult to explain. Like most soaps, the spray should possess larvicidal and, perhaps, ovicidal properties, while the small amount of free caustic potash may be of value.

The two recognised stomach poisons, lead arsenate and thiodiphenylamine provided reasonable control, the latter being somewhat inferior.

In any spray schedule for the control of codling moth, three considerations are important, viz.:—

1. Residues on the fruit of any kind, toxic or otherwise, are undesirable. Lead arsenate used according to the commoner spray schedules suffers from this disability, and its continued use is largely attributable to its relatively low cost and reasonable efficiency. Washing with various solutions, chiefly a dilute hydrochloric acid bath, is frequently necessary. Of the several sprays used in this experiment only one, bentonite sulphur-nicotine sulphate, left excessive deposits. Even after careful washing the bleached appearance of the surface from which residues had been removed contrasted unpleasantly with the natural colour of the fruit. It is improbable, therefore, that bentonite sulphur-nicotine sulphate, as at present available, can be used to advantage for codling moth control.

2. Joint sprays are sometimes preferable to single purpose sprays. Codling moth is only one source of loss, for both powdery mildew and red mite are apt to be troublesome. Sulphur in some form or other is useful for the control of these, and in an already heavy spray schedule the incorporation of sulphur with an effective insecticide for the control of codling moth is frequently desirable. All the sprays used containing sulphur gave control of both powdery mildew and red mite, while nicotine sulphate-white oil and potash soft soap both adequately controlled red mite.

3. Costs must not be excessive. The cost of insecticides in the spray programme necessitated by codling moth infestation is already considerable, even with a lead arsenate schedule. In Table II. the cost per 40 gallons of the several sprays used for which prices are available is indicated. From a purely codling moth control viewpoint, taking into account both efficiency and cost, potash soft soap is the only spray material which compares at all favourably with lead arsenate. Rather than use a combined spray for this purpose at a much higher cost, it would obviously be preferable to treat the potash soft soap as a single purpose spray, adding sulphur or some such ingredient when the exigencies of the disease situation require it. Costs would thus be kept within reasonable dimensions.

Summary.

1. The experiment was designed to compare various non-arsenical sprays with the lead arsenate schedule for the control of codling moth. all trees receiving an initial lead arsenate calyx spray.

2. The majority of the injured fruits were penetrated by the larvæ at the side and not at the calyx end of the fruit.

3. Superficial injury to the rind of the fruit is attributed to the spreader, and the possible association of leaf scorch with the use of lead arsenate for the control of codling moth is discussed.

4. Five non-arsenical sprays, bentonite sulphur-nictotine sulphate. colloidal sulphur-nicotine sulphate, nicotine sulphate-white oil, potash soft soap and colloidal sulphur-potash soft soap, gave very promising results. Potash soft soap alone compares favourably with lead arsenate so far as price is concerned, and, as colloidal sulphur can conveniently be added when necessary for the control of powdery mildew and red mite, more exhaustive studies of this insecticide will be carried out in the coming season.

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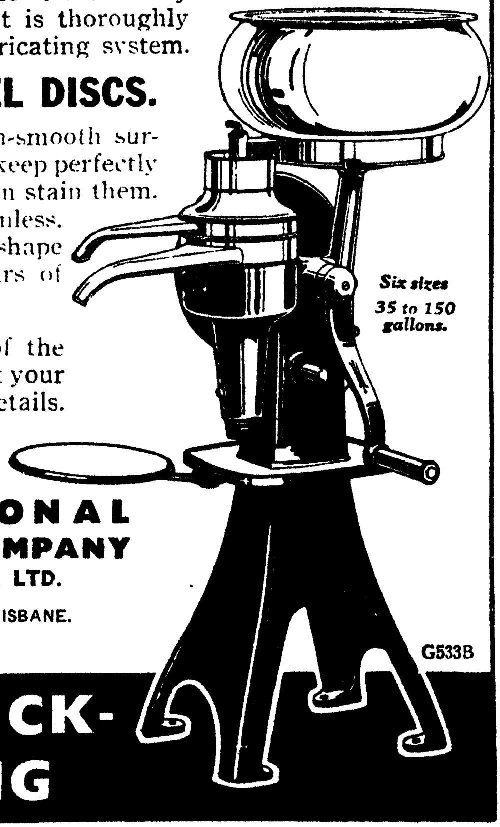

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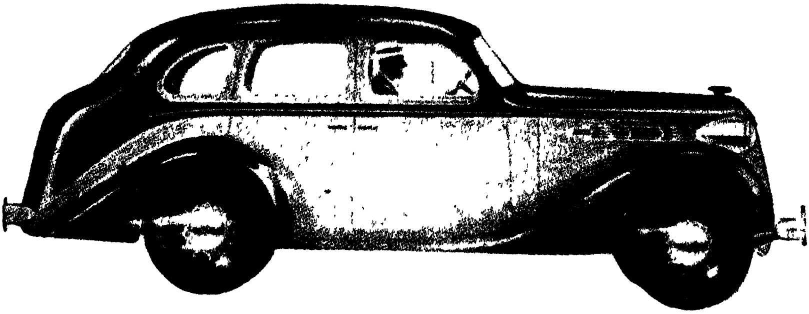

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Acknowledgments.

Thanks are tendered to Mr. R. Wells for making available experimental trees on his orchard, and to Mr. Robert Veitch, Director of Plant Industry (Research), for his critical interest in the work.

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HOME-MADE GATE HINGES.

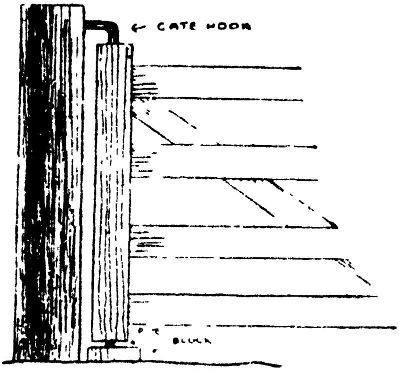

Plate 94.

Two methods of making cheap and effective gate hinges are illustrated. In the first the ordinary gate hook—or a round iron bent to a right angle—is driven into the hingle post with the point downwards. A block on which the gate is to turn is sunk in the ground immediately under this, and is bored to take a short length of ½ inch or ¾ inch piping. The timber joining the hinge end of the gate is also bored to receive these irons, ground block is raised to the correct height and rammed after the gate is fitted to the hinges. In the second illustration two rails on both fence and gate are extended and bored to take a length of ¾ inch pipe, which acts as an efficient hinge.

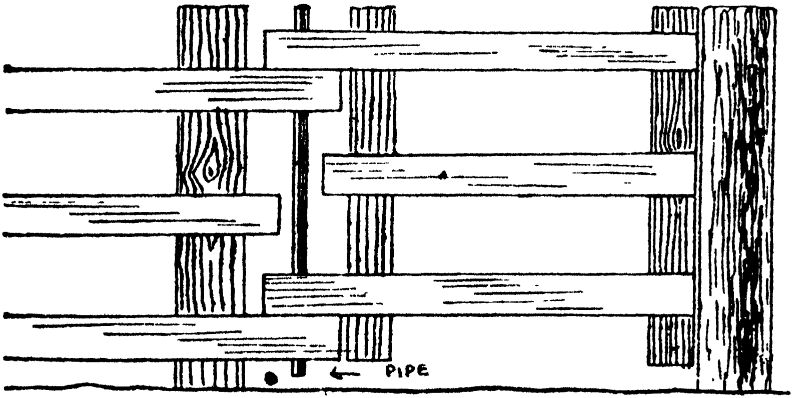

Plate 95.

Sown Pastures and their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Agrostologist.

[*Continued from p.* 135, *Part* 2, *Vol. XLVIII.—August,* 1937.]

(PART III.)

NUTRITIVE VALUE OF PASTURES.

A SINGLE chemical analysis of a plant is insufficient of itself as a basis on which to estimate the plant's feeding value. The nutritive value of a pasture grass or clover depends upon its palatability, chemical composition, and digestibility, and upon the class of animal to which it is fed. Three generalisations may be made, namely:—

1. The stage of growth and conditions of growth have a marked influence on the nutritive value of pasture.
2. Chemical analyses give some idea of the feeding value, but only through the grazing animal can palatability and digestibility be determined.
3. All things considered, certain pasture plants have a higher nutritive value than others.

A good deal of evidence has been adduced tending to show that the young growth of most pasture plants is superior in feeding value to the mature growth. Short, young pasture, growing under good conditions, is well provided with proteins, fats, carbohydrates, and minerals—all in a highly digestible form. As the pasture grows older the protein and mineral contents generally fall and indigestible fibre increases at the expense of the carbohydrates. In view of this general trend, different plants cannot be compared on their chemical analyses unless the samples represent material of approximately the same stage of growth. Whilst most pasture plants are of higher feeding value when young than when mature, certain plants only become palatable after maturity, and so the young growth is actually of little or no value to stock. The palatability and chemical composition of pasture plants vary with seasonal conditions and with soil fertility as well as with the stage of growth.

The value of chemical analyses in comparing feeding values is lessened by the fact that palatability and digestibility are factors as important as the quantity of the different nutrients in each 100 lb. of the pasture. Obviously, if a plant is neglected entirely by stock as a consequence of its unpalatability its feeding value is nil. Again, a particular plant might appear on the basis of its chemical analysis to have a high feeding value, yet actually might be an inferior fodder because of the indigestible nature of its contents. Unfortunately, feeding trials to determine the exact value under all conditions of each of the better-known pasture plants would involve a tremendous amount of work and expense; but information in regard to certain species is being collected. Where digestibility figures are not available, palatability tests and chemical analyses (the latter interpreted in a common-sense manner) must form the bases of comparative tables.

It is apparent to all who have had experience with various pasture types that some plants (for example, paspalum, Rhodes grass, Kikuyu grass, and lucerne) are of much greater value for feeding purposes generally than are spear grasses, barbed-wire grass, and the like. Feeding trials probably would reveal the fact that plants of the former group contain a higher proportion of digestible nutrients than those of the latter series, and chemical analyses certainly point that way. Clovers and other legumes of recognised pasture value generally differ from grasses in possessing a higher proportion of proteins in relation to fats and carbohydrates, and a higher proportion of useful minerals.

A very large number of chemical analyses of pasture plants have been made by the Agricultural Chemist of the Department of Agriculture and Stock, and selected analyses are set out in the accompanying table (Table I.). In addition to indicating in some measure the distinctions between various pasture plants, the analyses in many instances show the differences between young growth and mature growth. All the analyses recorded in the table have been made after the water has been removed from the plants by oven-drying.

TABLE I.

Plant.*	Description of Sample.	Analysis of water-free material.				
		Crude Protein.	Crude Fat.	Crude Fibre.	Analysis of ash	
					Lime.	Phosphoric Acid
		%	%	%	%	%
Para grass	Young, leafy growth ..	24·8	0·6	23·2	0·666	0·675
	Mature growth	5·8	1·0	38·0	0·368	0·208
Buffel grass	Young, leafy growth .	18·0	1·6	27·0	0·953	0·670
	Stemmy plants	6·1	1·3	37·0	..	..
Rhodes grass ..	Young, leafy growth	16·4	1·7	27·1	1·199	0·724
	Old, stemmy growth	5·8	1·2	33·3	0·579	0·604
Couch grass	Leafy growth	18·2	1·3	23·5	0·868	0·607
African Star grass ..	Young, leafy growth .. .. (one sample only)	30·1	2·5	18·8	1·184	0·831
Blue couch grass ..	Leafy growth	18·3	2·0	24·4	0·522	0·776
Woolly finger grass	Leafy growth	20·0	2·1	27·2	0·358	0·628
	Coarse, in full seed	6·5	0·8	37·9	0·236	0·216
Molasses grass ..	Young growth	11·9	1·4	28·4	0·244	0·239
	Coarse growth after seeding ..	3·3	0·8	40·8	0·416	0·172
Giant panic grass ..	Leafy growth	19·2	1·9	19·5	0·542	0·365
	Stemmy material	6·2	0·7	30·4	0·347	0·476
Guinea grass ..	Young, leafy growth ..	13·1	0·9	25·8	1·278	0·757
	Old, stemmy growth	4·5	0·6	39·7	0·410	0·148
Paspalum . ..	Short, young grass . ..	20·6	1·6	23·7	0·412	0·618
	Old, stemmy growth . ..	4·1	0·9	41·4	0·239	0·139
Kikuyu grass ..	Young growth	16·7	1·4	31·2	0·436	0·884
	Growth from old plants ..	8·8	1·4	27·1	0·416	0·697
Elephant grass ..	Young shoots	21·0	1·5	23·2	0·761	0·429
	Shoots from 7 feet stalks ..	7·0	0·7	44·1	0·197	0·081
Cowcane . ..	Young, new growth . ..	12·8	1·1	31·0	1·089	0·731
	First ratoon cane	2·2	0·6	27·6	0·284	0·181
Prairie grass ..	Short, young grass . .	29·2	3·6	19·3	1·142	0·827
	Older growth	5·0	1·7	31·9	..	..
Cocksfoot .. .	Short, young grass . ..	24·9	3·4	17·5	0·643	0·365
	Older growth	10·6	3·8	31·0	0·828	0·946
Perennial rye-grass .	Short, young grass ..	21·6	2·9	19·3	1·025	0·954
	Older growth	12·7	1·1	22·3	0·718	0·938
Wimmera rye-grass ..	Short, young grass . ..	24·7	2·3	19·7	1·014	1·189
	Older growth	6·8	1·7	22·5	..	..
Italian rye-grass ..	Short, young grass . ..	22·7	1·9	19·9	1·000	0·986
	Older growth	10·6	1·8	20·9	..	..
Phalaris	Short, young grass . ..	25·9	2·9	19·6	0·503	0·338
	Older growth	10·8	3·8	27·7	0·818	1·132
Lucerne	Young, leafy growth . ..	29·4	1·2	17·0	1·979	1·010
	Old, mature growth	18·4	1·2	32·6	3·545	0·679
Townsville lucerne ..	Young, succulent growth ..	14·2	1·0	25·9	2·500	0·503
	Older growth	13·5	1·5	32·1	1·534	0·243
Burr medic	Immature growth	29·5	0·9	16·4	1·390	0·991
	Mature growth	28·8	0·9	18·4	1·461	0·948
Black medic	Hay stage	15·5	1·8	[illegible]8·7	2·391	0·858
Red clover	In flower	23·0	1·7	15·4	3·245	0·756
	Full hay stage	19·0	1·6	17·8	3·540	0·790
White clover ..	Young, leafy growth	29·9	1·5	16·9	1·569	1·185
	Old growth	18·1	1·5	22·1	2·078	0·528
Wheat	Young, leafy growth	33·0	3·4	19·7	0·836	1·611
	Older growth	10·2	2·7	27·9	0·484	0·721
Oats	Young, leafy growth	33·3	3·1	20·8	..	..
	Older growth	13·3	3·6	26·1	0·715	0·975

* A check list of common and scientific names of the chief pasture plants is contained in a later section.

PERMANENT SUMMER-GROWING GRASSES.

Para Grass (*Brachiaria mutica* Stapf).

Origin and Distribution.—Para grass, also known in Queensland as *Panicum muticum,* panicum, giant couch, or Bancroft grass, is a native of either Brazil or tropical Africa, used extensively in many tropical and sub-tropical countries for grazing and fodder purposes. It was introduced to Queensland about 1880, and is now grown in scattered areas right along the eastern seaboard, which has a moderately heavy to extremely heavy rainfall, and to a slight extent in frost-free areas up to 100 miles from the coast. Para grass can be recommended for use on coastal dairy farms and grazing properties as an adjunct to other cultivated pastures, or as the main cultivated pasture in certain areas, and if planted in damp situations will represent a marked improvement on the usual feed available in such places.

Plate 96.

Para grass, showing habit of growth.

Description.—Para grass (Plate 96) is a rapidly-growing perennial grass with broad, hairy leaves up to 12 inches in length. Its early habit is to produce stout runners which grow along the surface of the ground and form a shallow root system at each joint. Later, upright shoots are developed at the joints and the creeping stems themselves turn upwards. The latter spread very quickly, and the area occupied by the grass rapidly increases in extent and in density of cover. The grass may reach a height of several feet under favourable growing conditions, and usually the stand is so dense that only plants of a similar straggling habit are able to grow in competition with it. Though the grass flowers in Southern Queensland, it is only in the tropics that seedheads are produced in any appreciable quantity. The seedhead has the form of a number of 1-3-inch spikes occurring at irregular intervals along the top 6-9 inches of the seed stalk.

Climatic Requirements.—The distribution of Para grass is a reflection of its climatic requirements. Essentially a grass of the tropics and sub-tropics, it is cut back severely by frosts, and so is less desirable than certain other grasses for areas subject to low temperatures. In heavy rainfall districts it thrives during the wet season, and is sufficiently drought-resistant to survive (and, in many instances, produce a moderate amount of feed) during the long, dry period experienced on parts of the coast during the autumn, winter, and spring months.

Soils.—Para grass evinces a preference for soils which retain moisture well, and will thrive on waterlogged soils and even in waterholes and streams. On porous soils and on dry and infertile soils it is of little value.

Planting.—Unless it is harvested very carefully, seed of Para grass is likely to be of extremely poor quality and unsuitable for sowing purposes. Sowings of well-filled seed made at the rate of 2 to 3 lb. per acre have in some instances produced good stands. The usual method of propagation is to plant stem cuttings. Each cutting should have two or three joints; and, when planted, at least one joint should be buried in the soil. Rooting takes place at the buried joints, and if the cuttings are planted up to 5 feet apart each way, a good ground cover of runners is quickly obtained on clean land. An alternative method, which might well be used where ample fresh stems are available, is to run out furrows 3 feet apart and scatter mowings or chopped-up pieces of the stems in them covering them with a plough. On fresh scrub burns stem pieces probably would strike if scattered on the ashes during wet weather, but "dibbling-in" is preferable. The grass requires from two to six months to become established sufficiently well to permit of grazing or cutting.

If land intended for Para grass pasture is cultivable it should be ploughed and cultivated in order to provide good soil conditions for the grass. On areas carrying logs or stumps, or which are too wet for ploughing, the grass must be mattocked in. The best time to plant is during the spring or summer months, the actual time depending on the moisture content of the soil and the prospects of seasonal rains.

Though in Queensland Para grass is usually planted in a pure stand, it is reported from various other countries that both the productivity and the feeding value of the pasture may be increased by annual sowings of cowpeas or velvet beans. These legumes are sown when the pasture grass is being planted, and in subsequent years planted in holes made in the sod with a sharp stick, or, better still, broadcasted after a shallow ploughing of the sod.

Management.—Para grass commonly is both grazed and cut for green feed. On farms where only small patches of the grass exist the usual practice is to cut the grass with a hook or scythe, and feed the green material to stock. More extensive areas are used for grazing, but precautions should be taken to prevent damage to the pasture. The runners of the grass must be permitted to secure a firm foothold before the young stand is grazed, and continuous heavy grazing of the pasture must be avoided. Grazings or cuttings should be regulated in such a way that the feed is used before it becomes coarse.

Conservation.—Para grass should be quite suitable for silage purposes, but its use as hay is likely to be small in the wet districts in which it grows best.

Feeding Value.—The palatability of the young growth of Para grass to all classes of stock is high, and its feeding value quite good. The older growth is dry and woody and has a reduced feeding value.

Pests and Diseases.—Comparative freedom from pests and diseases is a feature of Para grass, which renders it of particular value in paspalum areas as an alternative pasture to ergot-susceptible paspalum. A Coccid bug, with which is associated a sooty mould, attacks the young shoots, but does not cause serious damage.

Special Uses.—Para grass may be used for reclaiming boggy areas of land. It also is useful as a soil-binder.

Undesirable Features.—Within recent years Para grass has come to be looked upon with disfavour in certain areas (particularly on the Upper Tweed River in New South Wales), because of its habit of invading irrigation channels and small streams and impeding the flow of water.

The grass may also assume pest proportions on low-lying cultivation lands if steps are not taken to destroy the plants before they have gained a hold on too large an area. Where heavy infestations occur the land can be cleared by hard grazing during a dry spell.

Rhodes Grass (*Chloris Gayana* Kunth.).

Origin and Distribution.—Rivalled in importance only by *Paspalum dilatatum*, Rhodes grass is now grown over a wide area in Queensland and is the chief pasture grass in many districts too dry to support paspalum pastures. It is a native of Southern Africa and has been introduced for pasture purposes to many sub-tropical and warm temperate countries. It is understood to have reached Queensland from New South Wales about 1905. It quickly came into favour throughout the Burnett district and on the Atherton Tableland, and was grown as far west as Mitchell, in the Maranoa, by 1912. During the first decade following its introduction to Queensland, Rhodes grass was sown almost entirely on land cleared of softwood scrub or brigalow scrub; but, within the past twenty years, a good deal of fertile forest country has been laid down to it. Since the introduction of the prickly-pear parasite, *Cactoblastis cactorum*, many thousands of acres of reclaimed brigalow scrub country have been brought into economic production by the sowing of Rhodes grass.

Plate 97.

A stand of Rhodes grass in the hay stage.

Plate 98.
Rhodes grass.

A good deal of Queensland, within the climatic zone satisfactory for Rhodes grass, possesses soils suited to the grass. This includes not only the land at present devoted to dairying but also vast areas of grazing country now carrying native grasses or timber. The extension of the Rhodes grass areas on to grazing properties has now commenced, and a rapid expansion is likely when graziers generally come to realise the increase in carrying capacity which may be obtained by replacing certain native grasses and trees by such a heavy-yielding pasture and hay grass as Rhodes grass.

Description.—Rhodes grass (Plate 98) is a perennial, tufted plant, with erect, leafy flowering stems and spreading surface runners which root at the nodes or joints. So readily are the runners formed that a good ground cover is obtained within a few months of sowing under favourable soil and weather conditions. From each node of the runners are produced leafy stems which may attain a height of over 4 feet. The long flowering stems bear at the top clumps of 10-14 radiating, brownish-green seed spikes.

Climatic Requirements.—Rhodes grass is primarily a summer grower, making most of its growth during the period October to April. The areas best suited to the grass are those receiving an average annual rainfall of between 25 inches and 50 inches, of which most falls during the warmer months of the year. Districts receiving as low an average rainfall as 22 inches per annum may be suitable for Rhodes grass if the distribution of the rainfall is not extremely erratic. Protracted droughts often cause severe damage to Rhodes grass pasture, since the grass is not particularly adapted for drawing on deep-seated water supplies and has poor recuperative powers. Nevertheless, Rhodes grass may be considered fairly drought-resistant. Its resistance to frost injury is not of a high order.

Soils.—Rhodes grass is grown on a variety of soil types, but thrives best on loams, ranging from sandy loams of good-class forest country through red volcanic loams originally carrying softwood scrubs to clay loams of brigalow scrub areas. Light sandy soils and heavy black soils are not so suitable. On the latter type it is difficult to establish the grass satisfactorily.

Planting.—Being a summer-growing plant, Rhodes grass is best sown in the spring or early summer. If sown in the late summer, there is a danger of the young plants being destroyed by early frosts, and, similarly, late frosts may play havoc with very early plantings. Broadcasting by hand is the usual method of distributing the seed. Rhodes grass seed is variable in quality and seldom reaches a high standard of germinability. Occasional samples reach 80 per cent. germination, but many commercial lines fail to reach the standard of 30 per cent. prescribed by the Queensland Pure Seeds Acts. If good-quality seed is sown, 4 to 5 lb. per acre is sufficient to sow, but where there is any doubt as to the germinability heavier sowings, up to twice that quantity per acre, should be made.

Owing to the lack of a suitable pasture legume for sowing in conjunction with it, Rhodes grass is usually sown alone. In many districts light sowings of lucerne could be made in admixture with Rhodes grass, but in cotton-growing areas lucerne is a breeding crop for the destructive corn-ear worm of cotton. Various other legumes are being tested to determine their usefulness in Rhodes grass pastures.

Management.—The general principles of pasture management, as set out in an earlier section, should be applied in the management of Rhodes grass pastures. The pasture areas should be suitably subdivided to allow of short, intermittent grazings of each paddock, and the grazing should be so controlled that each paddock is eaten off when the growth is young and leafy. Hard grazing, particularly on light soils, must be avoided. The scattering of manure lying on the pasture should be regularly carried out wherever a suitable implement can be worked.

The mechanical treatment of Rhodes grass pastures is carried out by some farmers and appears to be productive of good results. Renovation may be carried a stage further by the judicious use of artificial fertilizers, such as superphosphate and sulphate of ammonia. Under heavy stocking conditions any renovation of Rhodes grass pastures by harrowing and top-dressing can be only temporary in nature, and the measures taken must be repeated at frequent intervals if the pasture is to be maintained in a high state of production. The position would be different if the pasture contained a reasonable proportion of legumes, for then top-dressing with superphosphate would be expected to stimulate the growth of the legumes and so indirectly enrich the soil in nitrates, &c.

In the absence of a leguminous element from the Rhodes grass pasture, the rejuvenation of old stands is a less effective means of pasture regeneration than is the sowing-down of fresh pastures following soil improvement. Probably old Rhodes grass land which has been ploughed up and cropped with lucerne for two or three years would sustain a good Rhodes grass pasture for some years following the ploughing-out of the lucerne. Other cropping programmes, with Rhodes grass occupying the land in most years, could be devised.

Conservation.—The fact that Rhodes grass is a valuable hay grass is not recognised sufficiently in Queensland (Plate 97). Provided that the stand is of a good type (that is, containing a preponderance of plants with abundant leaf and slender stems), a useful hay can be made from the grass. The quality of the hay, particularly its palatability, is rather variable, but all classes of stock will eat it without much waste. The yield also is variable, of course, but on fertile soil young stands should provide at least two cuttings, each of 1½ to 2 tons of hay, per annum. In the fairly dry areas in which Rhodes grass is grown largely the hay is easily cured. In most instances it should be in the stack within forty-eight hours of cutting. The last cutting for hay should be made some weeks before the weather becomes really cold, in order to permit of the growth of aftermath suitable for winter grazing. Where frosts are experienced a growth of about 2 feet should be provided for; the upper part of this will be frosted, but the sheltered basal shoots will provide some picking.

In addition to its usefulness as hay, Rhodes grass should be valuable as silage. A yield of from 4 to 6 tons of green material per acre may be expected.

Feeding Value.—As a rule, provided it is cut or grazed before it matures, Rhodes grass is of moderate to high palatability, though in the coastal districts, and on certain types in the drier areas, the plant is often neglected by stock. Its recovery after grazing or cutting is good, particularly so in young stands, provided that the weather conditions are not adverse. The feeding value of the leafy material of Rhodes grass pastures growing under favourable conditions is excellent, the grass being rich in proteins and other nutrients.

Seed Production.—The bulk of the Rhodes grass seed sold in Queensland is produced within the State and is harvested by hand.

Pests and Diseases.—Rhodes grass pastures fortunately are little affected by pests and diseases. Outbreaks of white grubs of the genus *Rhopœa* have occurred in the southern part of the State on basaltic scrub soils and there is some danger of the pest assuming serious proportions. Red spider occasionally causes slight damage, whilst Coccid injury is of some consequence. Rust is a rare ocurrence.

Special Uses.—On account of its running habit, Rhodes grass is of some value in protecting soil from erosive agencies.

Undesirable Features.—Some farmers hesitate to plant Rhodes grass on land which they intend to use in the future for cultivated crops owing to a fear that its subsequent eradication will prove difficult. This fear, however, is groundless, as Rhodes grass has no underground runners and is destroyed easily by ploughing and ordinary cultivation

Paspalum (*Paspalum dilatatum* Poiret).

Origin and Distribution.—A native of South America, *Paspalum dilatatum* is now widespread in many tropical and sub-tropical countries and is grown as a secondary pasture grass in a number of temperate areas. It was introduced into New South Wales towards the end of last century and rapidly came into favour in the coastal areas of that State. The grass soon came to be employed in coastal Queensland and has proved useful, especially under irrigation conditions, in Victoria and Western Australia.

Description.—In habit paspalum (Plate 99) is a perennial tufted grass with clustered, erect stems and shortly-creeping rootstocks by means of which a sown pasture of the grass forms a compact sod. The short underground runners are responsible, in a large measure, for the ability of the grass, once established, to survive heavy grazing, since the growing buds are located underground and so escape damage from trampling. Long, broad leaves are produced in abundance from the crown of the plant and sparingly along the flowering stems. If allowed to mature, a pasture of paspalum may reach a height of several feet; but, except on seed areas, it is unwise to permit the grass to grow taller than 12 inches.

Climatic Requirements.—Paspalum is essentially a summer-growing grass and for its full development requires a warm, moist growing season. Conditions on our tropical coast appear, however, to be somewhat unsuited to paspalum, with the result that the main paspalum areas of Queensland are the South, Lower North, and Central North coastlands, the highlands adjacent thereto (Springbrook, Tamborine Mountain, Maleny Plateau, Blackall Range), the Atherton Tableland, and one or two plateau areas west of the coastal ranges. These areas experience an average annual rainfall of over 50 inches, most of which falls during the summer. Paspalum is grown to some extent in lower rainfall areas, chiefly in low, moist situations; but where the rainfall average is below 40 inches per annum paspalum pastures are of minor importance. As a consequence of its moisture and warmth requirements, the grass makes almost its entire growth between October and May, with the maximum development during the wet months of January, February and March. Whilst it is unable to persist in dry climates, paspalum is capable of surviving fairly protracted periods without rain. Severe frosts destroy the grass, but light frosts merely retard its growth.

Soils.—A feature of paspalum is its fairly high soil fertility requirement. It will not thrive on poor country and should never be sown on other than fertile soils. Fortunately, most of the "scrub" and better-class forest country on which paspalum was sown up to forty years ago was originally very rich in plant foods and so capable of supporting a productive stand of paspalum for many years. Numerous areas, after having been under grass for a long period, have shown signs of a depletion of soil nutrients, and are in need of special renovation measures.

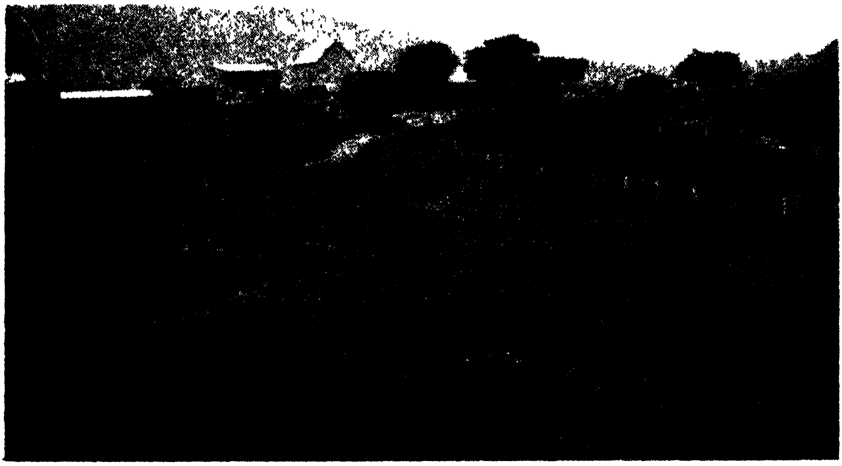

Plate 99.
A paspalum pasture.

Planting.—Paspalum should be sown in the spring or early summer either on fresh scrub burns or on ploughed and worked-down land of high or reasonably high fertility. A seeding rate of 8 to 12 lb. per acre is recommended. During the summer of 1935-36 an extensive outbreak of ergot occurred in paspalum areas throughout Eastern Australia, and this was repeated to a lesser extent in 1936-37; consequently, there is a possibility that much of the seed coming on to the market for the next year or two at least will be ergotised and of low germinating capacity. Buyers, therefore, should be careful in making seed purchases, and in doubtful cases should submit samples to the Department of Agriculture and Stock for examination. Even in the best commercial lines, however, the percentage of formed seed is rarely greater than 70 and the germinating capacity varies considerably with the age of the seed. It will be found generally that seed twelve months after harvest will have matured sufficiently to reach a standard of 30 per cent.

A delayed germination of sowings of immature seed sometimes is responsible for poor establishment; consequently, only good seed should be used. The usual method of sowing is broadcasting by hand and, if clovers are to be sown, the area should be gone over twice, first scattering the light grass seed and then distributing the "shotty" clover seeds.

Though paspalum is a very aggressive grass, it will permit certain other pasture plants to mix with it. Notable examples are white clover and tick trefoil, the latter being a prostrate summer-growing legume which has spread naturally into coastal pastures. The ability of white clover to mix with paspalum is of great value, since the clover, after remaining dormant throughout the warm months, produces valuable grazing, in many years, from July to November. Red clover also can be grown quite successfully with paspalum, and various summer and winter grasses will exist for a short time in admixture with it. Lespedeza, a valuable summer pasture legume in the South-eastern United States of America, can be established also in paspalum pastures.

Management.—Of the various types of pasture occurring in Queensland, none is better adapted to intensive management than the good paspalum pasture. Efficient subdivision must be carried out first and the best portion of the farm should receive first attention. The extent of subdivision of the area selected depends upon the size of the herd and on pasture conditions. First-class paspalum areas in the best districts could be subdivided advantageously in such a fashion that when the average number of milkers is concentrated on a paddock the rate of stocking is eight beasts to the acre.

For example, paddocks of five acres each would be about the best size on a farm milking forty cows throughout the warm months. Areas of lower productivity would not be subdivided to the same extent; and on many representative farms 10-acre paddocks would not be too large.

The number of paddocks should be six or more, as this will allow each paddock to be grazed for a few days when the paspalum is five to six inches tall and is of high feeding value. Under favourable seasonal conditions, and using six paddocks, paddock No. 1 should be ready for grazing again after the other five have been grazed in rotation; but where there is great risk of droughts or floods, it would be wise to have nine or ten paddocks for rotational grazing purposes. The animal droppings should be spread in each paddock after the grazing has been completed.

The possibility of the recurrence of epidemics of ergot disease, such as those which occurred in 1935-36 and 1936-37, renders the proper management of paspalum pastures a necessity. The formation of seed-heads must be restricted, either by grazing the grass down before the inflorescences emerge or, where practicable, by the use of a mower. When the number of stock is insufficient to keep the grass from seeding, burning may have to be resorted to, in order to destroy mature growth infested with ergot, but other means should be adopted wherever possible.

Paspalum pastures are particularly liable to decline in production because of adverse soil conditions brought about by various causes. If good pastures are to be maintained, a periodical breaking-up of the matted grass, and of the surface soil, is necessary. Special paspalum renovators have been designed for this purpose. The stump-jump type of tine implement is quite effective if sufficient horse power is available. In cases where tines of different sizes may be fitted, it is advisable to renovate in one direction to a depth of 5 or 6 inches with the fine points and then to cross-renovate, using the broader points. Before renovation is commenced it is advisable to mow any long, coarse grass on the area. Renovation by these means not only improves soil conditions but removes loose and dead grass and provides a seed-bed for any seeds which may be broadcast.

On badly matted areas ploughing of the paspalum is a more satisfactory way of reinvigorating the pasture. This should be done during the wet period of late summer, when weather conditions are favourable to the re-establishment of the grass. The land should be ploughed with a mouldboard plough deeply enough to turn the sod on to the side. Shallow ploughing, by turning the slice right over and exposing most of the roots to the air, tends to destroy the paspalum. Following the ploughing, the area should be levelled off with harrows, and seeds of white and red clovers broadcast. Such drastic treatment as the ploughing of the pasture will throw the treated area out of production for some months; but, if the farm is subdivided into small areas, one or two paddocks may be ploughed each year, thus providing for the turning-over of each paspalum paddock once every five or six years. The temporary loss of feed occasioned by severe renovation will be more than compensated for by the improved condition of the pasture during subsequent years.

A renovation by mechanical treatment should be followed by the broadcasting of seeds of white clover and red clover. On most soils the addition of between 1 and 2 cwt. of superphosphate per acre will encourage the development of the legumes.

Within recent years there has been a tendency for coastal dairy farmers to increase the cropped area on their farms. A rotation of maize and other crops (including green manures) and pasture probably would be the best method of farming. The pasture should be permitted to stand for only a very few years at a time. The building-up of the organic matter (or humus) of the soil by green manuring crops, such as cowpeas, appears to be of particular importance in the case of the porous red volcanic soils.

A useful method of adding a certain amount of organic matter to a pasture soil is to permit the grass to grow tall and rot down once in every three years or so.

Conservation.—The conservation of surplus pasture growth for feeding to stock in lean periods is of particular importance in coastal districts, where the difficulty of conserving hay on the farm is acute. Paspalum pasture is very suitable for silage-making purposes, and on well-managed farms the conservation of the excess growth fits into the general farm management. The grass should be cut when in early flower; and, if ergot disease is present, cutting prior to the formation of hard ergots is advisable in order to minimise the danger of poisoning stock fed on the silage.

Feeding Value.—Paspalum is a very palatable grass and is relished by all classes of live stock. The grass has its maximum value for cream production when in the young, leafy stage, and the pastures should be so managed that they are always grazed off in their most nutritive stage.

Pests and Diseases.—The major pest of paspalum in Queensland is the white grub, which causes very serious damage to paspalum pastures on the Atherton Tableland. The grubs are the larvæ of a beetle; and, if present in sufficient numbers, may ruin a pasture by destroying the underground portions of the plant. Remedial measures are at present being investigated, and farmers in the infested area are advised to procure pamphlet No. 33 of the Division of Entomology and Plant Pathology, Department of Agriculture and Stock, entitled "White Grub Damage to Pastures on the Atherton Tableland," by J. Harold Smith.

The fungus (*Claviceps paspali*) causing ergot in paspalum first appeared in epidemic form in Australia in 1935, and its widespread occurrence has been responsible for serious losses in stock and in dairy production. Details of the life history of the fungus, and of its effect on stock, are contained in separate departmental leaflets, which are available to farmers on request.

Undesirable Features.—In addition to that susceptibility to ergot, paspalum has the disadvantage of being somewhat of a pest on cultivated land. It establishes itself on fallow areas, in lucerne paddocks, &c., from seed transported by various means, and is rather difficult to eradicate.

Kikuyu Grass (*Pennisetum clandestinum* Hochstetter).

Origin and Distribution.—Since its introduction from Africa to Australia in 1919 Kikuyu grass has found considerable favour as a pasture grass for dairy cattle, chiefly in areas of summer rainfall. Because of the failure of the Australian material to set seed, Kikuyu grass has not been so spectacular a success as paspalum or Rhodes grass; yet it is a valuable adjunct to standard dairying pastures throughout Eastern Queensland.

Description.—Kikuyu grass is a summer-growing perennial grass which, under suitable conditions, spreads rapidly over and through the ground by means of running stems. Both the surface runners and the underground stems root freely at the nodes, anchoring the plant firmly in the ground and forming a dense turf which withstands heavy trampling by stock and "rooting" by pigs. The creeping and erect stems carry a large quantity of leaf, and the stems themselves are very succulent. Under favourable conditions, Kikuyu grass makes a very dense growth, often as much as 2 feet in height.

Climatic Requirements.—In Queensland the grass has adapted itself fairly readily to varying climatic conditions. It does best under moist, sub-tropical conditions; but will withstand a considerable amount of cold and remains green in spite of fairly heavy frosts. For this reason it is very valuable for late autumn and early winter grazing. Its drought resistance is fairly good and some success has been obtained on the Darling Downs and throughout the coastal river valleys (Burnett, Brisbane, Fassifern, Logan, &c.). At present it is used chiefly in the moist dairying districts as an alternative or as a supplement to paspalum. Its lower limit of average annual rainfall is about 27 inches.

Soils.—Kikuyu grass spreads most quickly and yields most grazing on loose, rich soils well provided with moisture, and while it may and does provide fair grazing on some less fertile soils of a sandy or clayey nature, a long-lived high-producing stand can only be assured if the grass is planted on fairly rich soils. Kikuyu grass draws heavily on soil nutrients, especially nitrates, and periodical ploughing to improve the soil conditions is desirable. Under special circumstances, the grass is recommended for poorer soils, such as in rough places or as a soil binder to prevent soil erosion.

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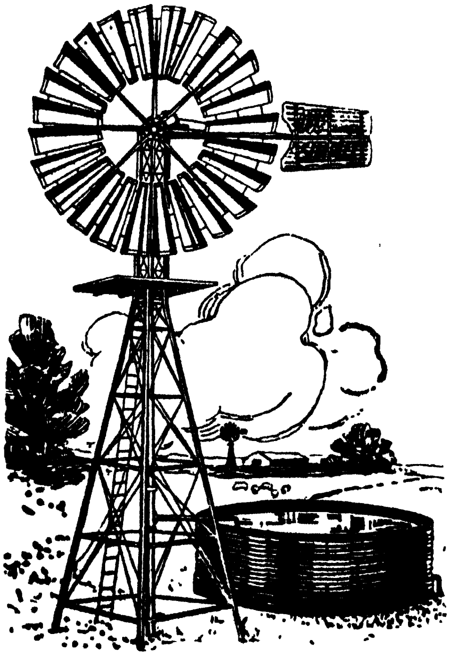

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Planting.—Whilst in some seasons Kikuyu grass flowers freely in Australia, seed is set very sparingly indeed and commercial supplies are not obtainable from that source. Propagating material is obtained by dividing the crowns of well-rooted plants, by cutting the rooted runners into sections, or by making cuttings of the erect stems. Each planting slip need be only a few inches in length but must have one or two nodes. Planting should be carried out during spring or summer. Cultivable land should be ploughed and harrowed and the cuttings planted 3 feet apart in drills run out a similar distance apart. The cuttings are best covered by hoeing earth on to them, leaving about one-third of the length of the cutting protruding from the soil, and the soil is firmed about each cutting by tramping. If a paddock is carrying only a light covering of grass, some farmers give it just a shallow ploughing and plant cuttings in each third or fourth furrow as the ploughing proceeds. This procedure is not desirable on any but the best soils; on medium-class soils it is preferable to build up the soil fertility before planting Kikuyu grass. The grass is often planted for special purposes, such as weed control or erosion control on rough country. The most practicable method of planting is to mattock the cuttings in and tramp the soil firmly around them.

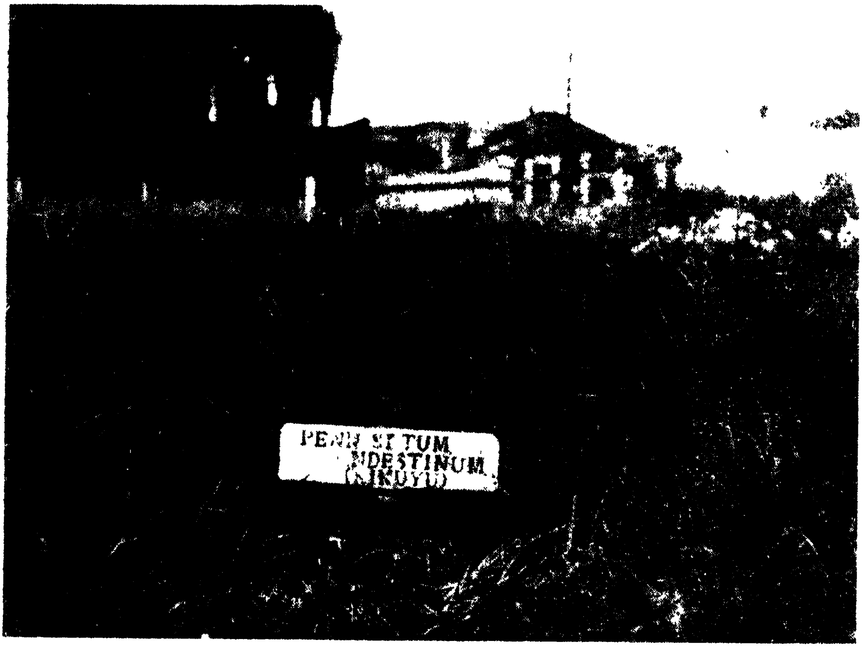

Plate 100.

Kikuyu grass.

Despite the very vigorous nature of the growth of Kikuyu grass, white clover is able to persist and thrive in association with the grass where soil and climatic conditions are suitable; and seed of white clover should be planted in Kikuyu paddocks on coastal scrub soils.

Management.—Good management of Kikuyu grass pastures involves intermittent grazing and periodical renovation. Judicious grazing, the scattering of manure and the stimulation of clover development, together with an annual disc harrowing or renovation with a paspalum renovator, will serve to keep the grass from becoming sodbound. If these measures are neglected the pasture will mat and ploughing will be necessary to give fresh life to the grass.

Conservation.—Kikuyu grass is very difficult to cut with the mower and difficult also to cure, so it is not well suited for conservation.

Feeding Value.—The palatability of Kikuyu grass is excellent and its feeding value is of a high order. The leafy portions of the plant, of course, are of the highest feeding value, and the pasture must be managed so as to keep the grass fairly short for the grazing animals. All classes of stock do well on Kikuyu grass pasture and the grass is particularly useful for pig pastures.

Special Uses.—Being a vigorous, smothering plant, Kikuyu grass is useful for planting in bracken-infested country. In addition to retarding the development of the bracken, it encourages stock to work in amongst the fern and trample it down.

Undesirable Features.—Though a valuable pasture grass, Kikuyu grass is liable to become a very troublesome weed if permitted to encroach on cultivation areas. For this reason it should not be planted adjacent to areas likely to be required for cultivation. In wet weather, portions of the grass are often broken off by grazing animals, and such pieces may be carried by the animals' feet to other portions of the farm and become established after having been trampled in. Whenever patches which have commenced in this manner are discovered in proximity to cultivation paddocks, they should be eradicated.

Molasses Grass (*Melinis minutiflora* Beauv.).

Origin and Distribution.—Molasses grass was introduced to Queensland over thirty years ago from tropical South America. It is a native of Africa and is said to have reached South America during slave-trade days. In Queensland it is grown extensively along the tropical eastern coastlands and to some extent on the Atherton Tableland.

Description.—Molasses grass (Plate 101) is a perennial grass of straggling habit, each tuft forming a large number of trailing stems up to five feet long and reaching a height of two feet or more. Under suitable conditions it is a very rapid grower, spreading quickly by means of the creeping stems and smothering out other growth by the dense mat which it forms. The ability of the grass to cover a cleared area quickly, to the exclusion of weeds, makes it very valuable for sowing on burnt-over areas on which weeds usually come away very quickly. Molasses grass has a strong and distinctive smell, due to the presence in the foliage of a volatile oil. In addition, the leaves exude a sticky secretion which is reputed to be repellent, and perhaps fatal, to ticks and mosquitoes. Four forms of the grass occur in Brazil—namely, "red," "white," "negro's hair," and "francano." Of these, the commonest form grown in Queensland probably is the red.

Climatic Requirements.—The areas to which molasses grass is best suited are the coastal districts north of Rockhampton—that is, the wet tropical region. It stands up to dry weather quite well, but in cool districts it is badly affected by frosts.

Soil Requirements.—Molasses grass does not demand particularly rich soils and does fairly well on forest soils in North Queensland. Even on dry and somewhat infertile soils it is of some value.

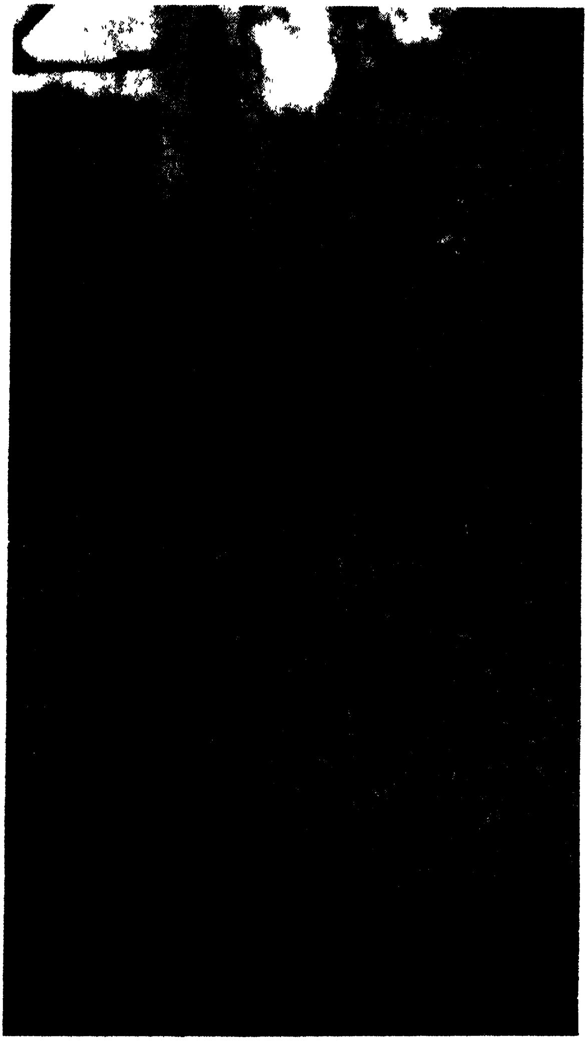

Plate 101.
A plant of molasses grass.

Planting.—The seed of molasses grass is extremely light, and if seed of good quality is used a seeding rate of 2 to 4 lb. per acre is ample in most cases. The germination capacity of a large proportion of the commercial seed of molasses grass is not particularly high and a 20 per cent. standard is set by the Pure Seeds Acts. The seed should be sown during spring or summer, either on scrub burns or on cultivated land. Broadcasting by hand is perhaps the best method of distribution. Instead of seeds, stem cuttings may be planted, but the sowing of seed is much less costly.

Molasses grass is generally sown alone, but the addition of from ½ to 1 lb. of seed of Townsville lucerne per acre probably would improve the pasture in many instances.

Management.—Molasses grass has its growing buds above the ground and is consequently unsuited to heavy, continuous grazing conditions. It should be sown in relatively small paddocks and spelled at intervals in order to permit of recovery from the intermittent grazings.

Conservation.—In South America molasses grass is often conserved as hay or as silage, but so far little or nothing has been done along similar lines in Queensland.

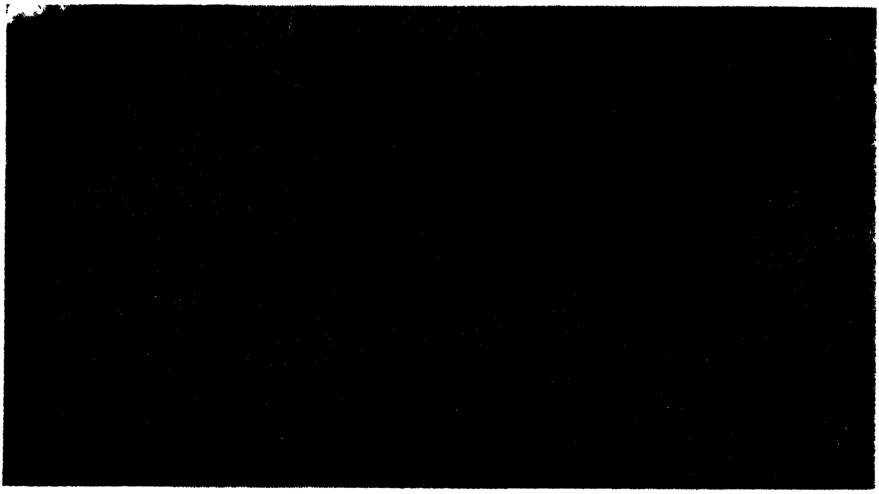

Plate 102.
A molasses grass pasture.

Feeding Value.—Stock at first show a distinct distaste for molasses grass; but, in North Queensland at least, they soon grow accustomed to it and eat it readily enough. Its nutritive value appears to be only moderate for dairy cows, though stock fatten on the grass quite rapidly.

Seed Production.—The poor quality of much of the molasses grass seed on the market may be attributed in part to too early harvesting and heavy threshing. The grass should not be cut for seed until a fair proportion is ripe; and the seed which falls when the cut plants dry will be of good quality.

Pests and Diseases.—No trouble from pests and diseases has been experienced in Queensland.

Giant Panic Grass (*Panicum antidotale* Retz.).

Origin and Distribution.—Giant panic grass, known also as blue panic grass, is native to Southern Asia, and was introduced to Australia many years ago. It is at present grown on small areas in Northern New South Wales and in Southern Queensland. Tests in progress indicate that the grass is likely to find a useful place on grazing properties from the coast to the interior.

Description.—Giant panic grass (Plate 103) is a tufted grass with an exceptionally vigorous rooting system, and forms short, strong underground stems from which are produced succulent leafy shoots that eventually may develop into cane-like flowering stalks. The underground runners and deeply-penetrating roots enable the grass to withstand heavy feeding and to survive dry conditions.

Climatic Requirements.—Whilst it thrives under fairly heavy summer rainfall conditions, giant panic grass is especially adapted to areas receiving an average annual rainfall of 20 to 40 inches. In such areas it responds well to storm rains during the summer and during the dry autumn remains green longer than most grasses. Heavy frosts cut the grass back, but light frosts do not interfere to a great extent with the production of green shoots from the joints of the stems.

Soils.—Giant panic grass is modest in its soil requirements, being able to thrive on a great variety of soils, ranging from sandy loams to stiff clays. Naturally, it does best on fairly fertile soils.

Plate 103.
Giant panic grass.

Planting.—The grass seeds freely and the seed is of fair germinating capacity. The minimum percentage of germinable seed desirable in commercial seed is 40, and better lines should be obtainable. The seed is small and light, and from 4 to 6 lb. should suffice to seed an acre. The seed may be broadcast by hand or machine, or drilled in, and should be lightly covered. The best time to sow is in the warm months, as the seedlings then become quickly established. The land should be cultivated if the seed-bed is not a fresh scrub burn. The grass can be established readily by means of rooted divisions of the tufts. Since it is as yet only employed on a small scale, giant panic grass is usually sown in a pure stand.

Management.—The management of giant panic pastures should aim at preventing the development of canelike stems, which are of inferior feeding value. The production of basal shoots of high nutritive value should be encouraged by intermittent grazing, which also will serve to restrict the tendency of the plant to grow rank.

Conservation.—It is difficult to obtain a heavy cutting of giant panic grass without including a high proportion of coarse, stemmy material; consequently, the grass is not likely to prove of much value for hay or silage-making purposes.

Feeding Value.—The feeding value of giant panic grass is fairly good, but the nutritive value of a grass is at its highest when the plant is in the young leafy stage, and giant panic should be kept eaten down to prevent the formation of canelike stems. This suggests that the grass should be sown in small enclosed areas upon which stock may be concentrated in numbers sufficiently large to ensure that the grass is eaten at the correct stage.

Seed Production.—Seed is set in fairly large quantities and may be harvested by hand.

Pests and Diseases.—None of its natural enemies cause much trouble to giant panic grass.

Undesirable Features.—An objectionable feature of giant panic grass is its tendency to spread on to areas on which grazing cannot be rigidly controlled, with the consequent danger of production of thickets of the grass to the detriment of grazing areas originally carrying finer grasses.

Guinea Grass (*Panicum maximum* Jacq.).

Origin and Distribution.—A native of Africa, Guinea grass is now naturalised in most wet countries within the tropics, and is used extensively for forage purposes in South America, the West Indies, Africa, the East Indies, South-eastern Asia, &c. It has been established in Queensland for many years and is fairly common under wild and, to a lesser extent, cultivated conditions along the coastal strip.

Description.—Though many different forms of the grass may be recognised, it generally occurs in large tufts from two to five feet in height and does not form a close turf, as do the better-class pasture grasses (Plate 104).

Climatic Requirements.—As may be gathered from a perusal of the list of countries in which it is important, Guinea grass thrives under warm, moist conditions. Its season of growth coincides with the summer wet season and during dry periods it is unproductive. Severe frosts weaken the grass or kill it and its use should be confined to areas free from heavy frosts.

Soils.—In its native country, Guinea grass is found on a wide range of soil types, and in Queensland it is found on railway embankments and on inferior soils as well as on rich country. For pasture purposes its use should be confined to fertile types of soil.

Plantings.—Guinea grass produces numerous seedheads which flower profusely. Little viable seed is set, however, and ripening is uneven. Much of the seed collected, consequently, is of poor germinating capacity and is almost worthless. The only reliable means of propagating the grass is by planting out rooted pieces of the crowns. These should be set out, spaced two feet apart each way, when rain falls in spring or early summer.

Management.—In most countries in which it is grown Guinea grass is cut and fed to stock in the green state; but, if it is used in small paddocks and grazed intermittently, the trampling of stock should do the pasture little harm.

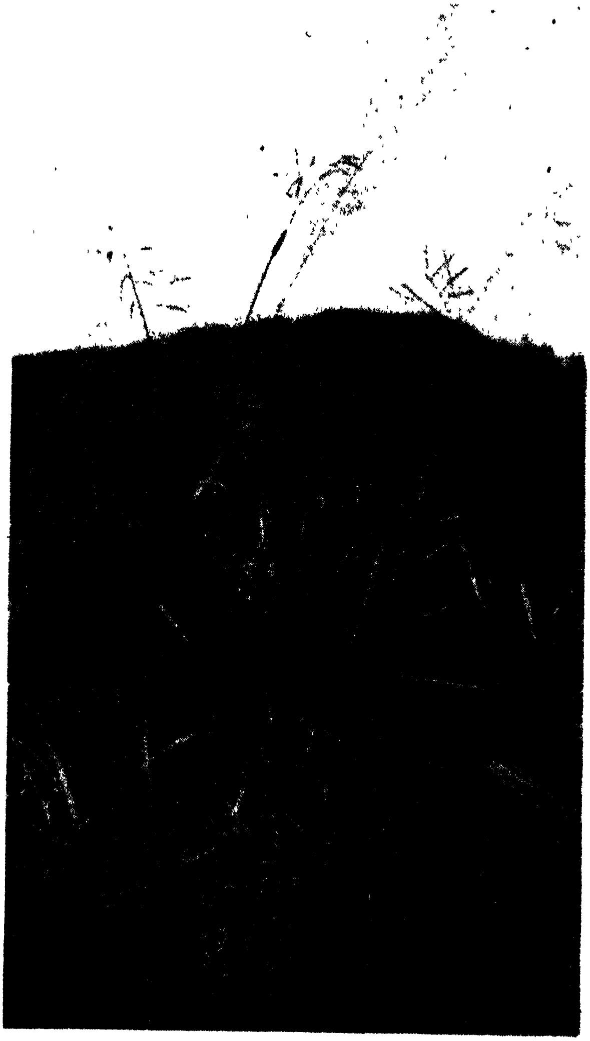

Plate 104.
Guinea grass.

Conservation.—Guinea grass makes an excellent hay if cut at the flowering stage. The chief difficulty associated with haymaking is the tufted nature of the plant, which often makes mowing difficult.

Feeding Value.—The grass is very palatable to stock, and the young growth has a high feeding value. Nutritive feed is provided also by Guinea grass hay and silage cut at the right stage.

Seed Production.—The unreliability of Guinea grass seed, other than hand-picked material, is a deterrent to the collection of commercial seed.

Undesirable Features.—In various parts of the world (including Queensland) Guinea grass specimens examined for cyanophoric-acid-yielding glucosides have given positive results, but the amount of prussic acid developed probably is insufficient, under normal grazing conditions, to poison stock.

Elephant Grass (*Pennisetum purpureum* Schum.).

Origin and Distribution.—Africa is the native home of elephant grass or, as it is known in most countries, Napier grass. It now is fairly common in various sub-tropical and tropical regions of the world, including South America, the Southern States of America, West Indies, East Indies, and Hawaii. It was introduced to Australia in 1914 and is now used to some extent in New South Wales and Queensland.

Description.—Elephant grass (Plate 105) is a canelike grass usually reaching a height of 7 or 8 feet, but occasionally growing much taller. It forms large tufts which tiller very freely. The main stems at maturity are extremely coarse and hard, but a large amount of palatable leaf is produced and, if the plant is grazed or cut at the correct stage, the hard stems do not develop.

Climatic Requirements.—Though the tropical coast is the most suitable area for elephant grass, it does quite well in many sub-tropical areas and is grown successfully in a large portion of Eastern Queensland. Its growing period coincides with the summer rainy season and little development is made during the winter months or during dry periods in the summer. The grass is very drought-resistant, and quickly produces feed after the breaking of the dry spell. The foliage is injured by frosts, but the underground parts are not damaged seriously.

Soils.—In common with all other heavy-producing grasses, elephant grass requires fertile soil conditions for its best development. Whilst it will produce feed on inferior soils, it is essential that fertile soil conditions should be provided if abundant feed is to be produced. Well-drained alluvials, scrub volcanics, and rich sandy loams are the best types of soils to use.

Planting.—Elephant grass sets seed very rarely in Australia, and the only material available for planting is the stem cuttings or crown divisions. These should be planted during the summer on well-prepared land. The stem pieces used should be cut from hard stems about six months old and each cane should possess four or five nodes. When planting material is abundant the stems can be cut into three-feet lengths and laid end to end in furrows. When cane pieces are used the furrows should be run out about four feet apart, and three or four inches deep, and the canes laid horizontally in the furrow and covered with soil. When root clumps are broken up for planting the pieces should be planted in hills about two feet apart in the row. After it has been planted the grass should be cultivated until it has become well established.

Management.—In most instances where elephant grass is grown on a farm, the area of the stand is very small and the crop usually is cut and fed green in the same way as maize and sorghum. The first cutting is made about three months after the time of planting, when the stems are four or five feet tall. The plant recovers quickly after having been cut, and three or four cuttings may be obtained in a season. Stems which appear to contain a high percentage of fibre should be chaffed before being fed.

Plate 105.
Elephant grass.

Within recent years extensive grazing areas of elephant grass have been established in Hawaii, and the grass is said to have shown its value definitely as a pasture grass when grazed intermittently. It is estimated that, under suitable growing conditions, one mature head of beef cattle per acre per year can be fattened on the grass.

Conservation.—Elephant grass is in some countries cut for silage, but the forms grown in Queensland appear to be somewhat too woody for this purpose when in the growth stage at which a bulk comparable with that obtainable from sorghums would be available.

Feeding Value.—The feeding value of elephant grass cut in the immature stage compares favourably with that of Sudan grass in respect to protein and minerals, and, as a heavy yield of immature grass can be obtained, elephant grass provides a large bulk of nutritious feed.

Seed Production.—Seed is set occasionally but not profusely enough to warrant collection, particularly as the plant may be propagated quite readily from cuttings, &c.

[TO BE CONTINUED.]

THE APIARY.

With the opening of the earliest spring flowers and the accompanying rise in temperature, the bees begin to collect the small amounts of nectar and pollen thus provided. As the weather becomes warmer the supplies rapidly increase, and the bees are stimulated greatly to build up the colony. Brood rearing begins as soon as the new supplies come to the hive, and as the first bees emerge they in turn increase the capacity of the colony for brood-rearing, so that with a good queen and other favourable conditions the amount of brood is increased rapidly.

The main object of the work in the spring is to ensure an abundance of bees in time for the coming honey flow, but during early breeding the bees should be disturbed as little as possible. In order to ascertain whether the bees have sufficient stores, the weight can be judged by tilting or lifting the hive, or the size of the cluster may be ascertained, without breaking the propolis which seals the cover, by looking at the combs from below.

On the first examination, which should take place when all danger of frosts is past, the beekeeper should look especially for queenless colonies. If any are found, it is best to unite these with normal colonies if queens are unobtainable. When uniting, two weak colonies should not be placed together, but a weak colony may be united with a strong one. If desired, the number of colonies can be restored later on, by subsequent division. The beekeeper should also examine the stores, for bees require large amounts of food during the spring, and, while they usually obtain considerable nectar outside, it is rarely enough to provide stores for the very rapid rate of breeding that takes place at this time. If food is needed it may be given rapidly in the form of thick sugar syrup, or, what is even better, combs of honey may be provided.

For those who are desirous of increasing their apiaries, this is a good time to purchase additional colonies. Although the prices asked at this time of the year are higher, usually, than those ruling in the autumn months, they may be expected, during normal seasons, to bring in an immediate return.

If it is intended to move colonies of bees to a different site, this is best done during the cooler months. A special ventilated cover is not necessary then owing to the bee population being less numerous, moreover, winter is the bee-keeper's slack period.

To move bees successfully, however, some preparations are necessary. All supers containing honey should be removed from the hives and carried separately, leaving only sufficient honey with the bees to see them to the journey's end. If the frames are self-spacing it is necessary merely to crowd them together and insert two wooden wedges between the outside frame and hive wall. With unspaced frames a pair of notched strips of wood must be cut for each colony. The sticks preserve the essential distance between each frame and in this way prevent crushing the insects. Two 1-inch nails will secure each stick in place at the ends of the frames. The bottom boards and hive covers should be secured with staples driven in the sides and back. One leg of the staple must be driven into the edge of the bottom board or cover as the case may be, and the other into the hive-body. At the close of the day, when the bees are all in, a narrow strip of wire cloth should be bent to a right angle lengthwise and tacked across the entrance so that it is closed securely.

For road travelling, hives should be packed on the motor truck so that the top-bars of the frames are parallel with the axle, as the combs resist the side rocking of the vehicle much better in that position.

H. Hacker.

Cotton Culture.

W. G. WELLS, Director of Cotton Culture and Senior Research Officer.

ALTHOUGH cotton has been grown commercially in Queensland at different times since 1860, the present period of cotton growing originated about 1920 under a system of Federal and State Government guaranteed prices, which induced farmers to try this crop over a wide range of soils and climatic conditions. Many failures resulted, of course, through lack of experience, but it was demonstrated clearly that excellent yields of good quality could be produced over much of the south-eastern portion of the State. Broadly speaking, the most promising results were obtained in the districts lying between the Great Dividing and the coastal ranges, and extending from Beaudesert in the south to the Fitzroy River and adjacent areas in the north, an area of roughly 400 miles long and from 50 to 100 miles wide.

Cotton now has been grown on an extensive scale in these districts for a considerable time, during which a range of climatic and rainfall conditions, varying from the driest season in sixty years to the wettest winter and spring in a similar period, has been experienced. An excellent opportunity thus has been presented to test it under very extreme conditions, and it has been demonstrated that cotton is a very suitable crop for many sections of the south-eastern portion of the State. In fact, it appears to be the most profitable cash crop that can be grown on many soils in most of the districts, and in several of the drier areas it is outstandingly the best.

PRODUCING COTTON.

Although cotton has been demonstrated to be very suitable for many districts, it is not considered advisable to concentrate on growing it under a one-crop system. Like every other agricultural crop, it is subject to failure, and investigations also have shown definitely that growing cotton year after year on the same soil is conducive to diminishing yields. It is recommended strongly, therefore, that cotton be grown in rotation with

fodder and grass crops. As dairying is well established in most of the cotton districts, such crops can be utilised to good advantage. Broadly speaking, it appears desirable especially in the drier areas, that farmers in the sections where cotton can be grown profitably should develop a cropping system whereby cotton will be the main cash crop, and dairying will be engaged in sufficiently to utilise the fodder and grass crops that have to be grown to keep the soils in the proper condition to produce high yields of cotton.

SUITABLE SOILS.

Variations of climate in a season and between seasons make it most difficult to obtain annually the maximum yield of which a soil is capable. It is believed, therefore, that the farmer should endeavour to ascertain the soils on his place which will produce good yields of cotton in several successive seasons rather than the soil which will produce a very high yield in one season and possibly a poor one in another. The cotton section of the Department accordingly has endeavoured to ascertain the soils in each district which will produce good yields under a wide range of climatic conditions, and, generally speaking, it appears that the clay loams overlying a clay subsoil at a depth of one to three feet approach the nearest to this ideal. Grouped under this soil type may be classed the slopes originally under ironbark, in some districts the broad leaf and in others the narrow leaf ironbark being used as the indicator; the lower slopes and flats associated with box trees of good size; the scrub soils of the brigalow series, especially if adjacent to lower slopes originally covered with box or ironbark; and also the brigalow-belah scrub mixture, if not of so low a level as to become waterlogged in a wet season. These soils appear to be very suitable for cotton growing, for in a dry season the clay subsoil holds the moisture up to the lateral and tap root system, while in a very wet season they become partially waterlogged, and therefore retard plant growth sufficiently to prevent excessive development, and yet not restrict the plants too much.

Other soil types which will produce good yields of cotton, but are more subject to crop fluctuations caused by climatic variations, are the rich loams and clay loams of the alluvial flats usually originally covered with blue gums and a mixture of blue gums, Moreton Bay ash, narrow leaf ironbark, and bloodwood. Of these soils the heavier clay loams associated with blue gums, especially if mixed with large box trees, appear to be the most reliable, although on all of them, if properly rotated with grass crops, excellent yields of cotton of good quality can be obtained.

UNSUITABLE SOILS.

The most unsuitable soils appear to be the deep red soils of the soft vine scrub series and the deep sandy loams of the river and creek alluvials. Cotton crops on both types usually are seriously affected by dry conditions and high temperatures owing to the requisite moisture content dropping to levels below the main lateral root system of the plants. Shedding occurs when this happens, and if heavy rains are experienced afterwards excessive growth generally develops, which is often severely attacked by various insect pests, and frequently no yields are obtained. Farmers should study the suitability of their soils very carefully. In some districts, where at first it was thought cotton could not be grown successfully, profitable cotton crops are now obtained, simply by changing over to other soil types which, fortunately, occur on nearly every farm.

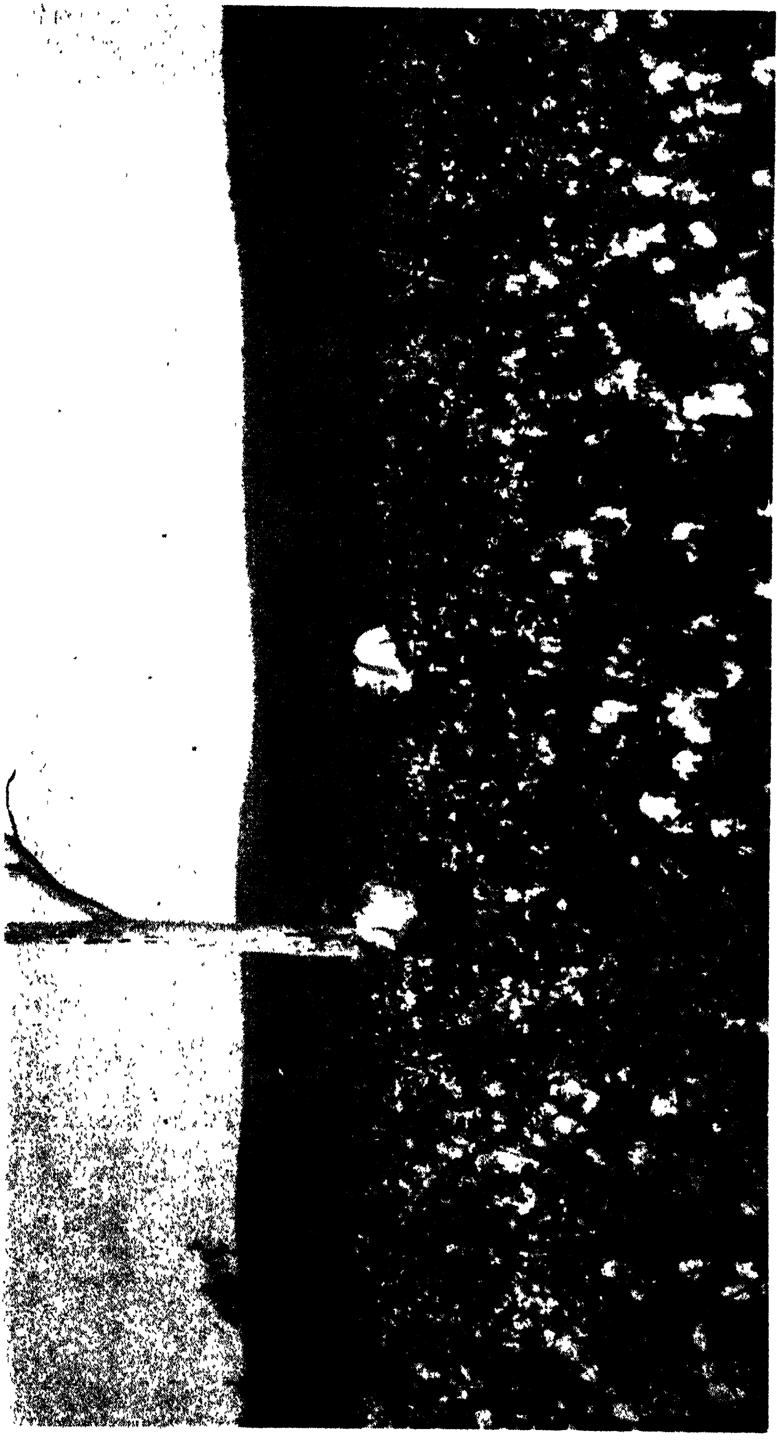

Plate 106.

A portion of a 100-acre field in the Callide Valley, Central Queensland, which averaged over 1,500 lb. of seed cotton per acre. Thousands of acres of forests have been cleared in this and other districts of Central and South-eastern Queensland for cotton-growing since 1924.

NEW CULTIVATION EFFECT.

Observations on all soil types throughout the cotton districts have shown that cotton, during the first two or three seasons following the first cultivation of newly broken-up grassland, has produced heavier yields of lint usually than adjacent cultivations on which cotton has been grown successively for a number of years. The explanation appears to be that a better balance of plant food and also much greater penetration of rain, especially storm rains, is obtained in the newer cultivations.

The continuous cultivation of row crops, such as cotton, causes the rapid decomposition of the original organic matter in the soil, consisting of grass roots and stalks, leaves of trees, &c. This decomposition is accompanied by a rapid increase in the readily available form of nitrogen called nitrate nitrogen, which is the product taken up by the plants. Within four years of cultivation after the breaking-up of the grassland the nitrate content of many of the more fertile loams and clay loams of the alluvials and softwood scrubs increases so much in mid-season that the actual contents of the plants, particularly late-sown ones, become so unbalanced as to affect the fruiting habits of the plants, especially in seasons with light rainfall in the spring and early summer, and heavy mid-seasonal rainfall. On fertile alluvial clay loams the initial nitrate content of new cultivations is often only 7 to 15 parts per million parts of soil, while with several seasons of cultivation of cotton crops it rises to 40 and sometimes as much as 60 parts per million.

The decomposition of organic matter which brings about this increase of supply of nitrates seriously affects the pore space of the upper soils. Investigations have shown that in the soils of a nine-year-old cultivation the total amount of carbon is reduced, a unit volume of soil weighs more, the absorption of moisture is decreased, and the surface soils become more compacted, thereby lessening the penetration of storm rains. In one experiment at the Cotton Research Station, following a steady beating storm of 2·46 inches lasting over twenty-five hours, it was ascertained that only 35 per cent. of the rain penetrated in the upper 18 inches of soil in a nine-year-old cultivation in cotton, as compared with 74 per cent. in a two-year-old cultivation in cotton. As the mid-seasonal rainfall is often of a severe beating nature, it is obvious that the cotton crops on the older soils do not receive the fullest possible benefit from such storms.

Studies made of the movement of the nitrates indicate that the more open surface of the newer cultivations may be of decided advantage in respect to the nitrate absorption by the cotton plants. The bulk of the large lateral root system of a cotton plant on the clay loam soils occurs usually in the first 7 inches of soil. As the nitrates are manufactured in this zone, it follows that in an open soil a greater washing-down of the nitrates occurs with the better penetration of the rains. The nitrate content of the soils around the main lateral system therefore would be reduced more often in the newer cultivations in a wet season, which would tend to bring about a better balance of plant food and thus cause the plants to make less rank growth and fruit more heavily.

CROP ROTATIONS.

Obviously new cultivations cannot be brought in continuously, hence it is necessary to ascertain the system of rotation that will keep the soils in a state best suited to the production of high yields of cotton. Rotation experiments carried out at the research station over a series

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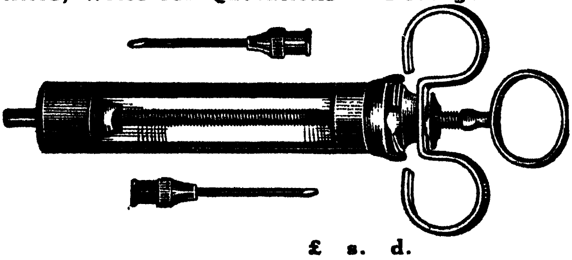

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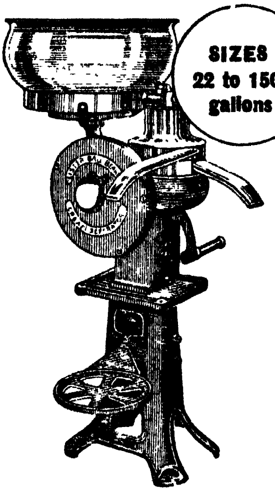

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of years indicate that some gain can be obtained by growing cotton alternately with giant setaria (giant panicum), maize, sorghum, and such fodder crops. Indications have also been obtained that possibly better yields will be produced where cotton is grown following two fodder crops. Another rotation that is proving most successful is one in which Rhodes grass is grown for three seasons on old cotton land, after which cotton is sown for two or three seasons, depending on the fertility of the soils. Analyses of soils where such a rotation has been practised have shown that Rhodes grass reduces the nitrates substantially during the first two years of growth. Illustrations of the suitability of this rotation on scrub soils have been seen in all districts, and it is recommended strongly that all growers test out the value of a Rhodes grass-cotton rotation on their soils. The food value of the Rhodes grass is high for dairy cows, and, in addition, there is less labour involved in growing it for three seasons than would be required for three ordinary fodder crops.

Plate 107.

ROTATE RHODES GRASS WITH COTTON.—The four or five year old unstumped Rhodes grass paddocks should be brought into cultivation for growing cotton. Excellent yields of cotton are obtained on this class of heavy brigalow scrub soil. After three years of cultivation heavy growth is produced in the resowing of Rhodes grass.

Whatever programme is finally followed, it is necessary to have some rotation of crops if the cotton yields are to be profitable. The soil must be kept in the best condition for cotton growing, otherwise highly varying yields caused by seasonal variations and insect attacks, are certain to be obtained. In addition, the rotation of grass and fodder crops with cotton will help materially in controlling weed growth, and thus reduce the cost of production.

SIZE OF AREAS.

At present the area of cotton per farm varies from 1 to 150 acres, with the average ranging from 5 to 10 acres for the smaller farms to 30 and 40 for the larger ones, also a good sprinkling of 60, 80, and 100-acre crops. The most suitable area depends entirely on the system of farming which is followed. When grown in conjunction with dairying the size of the herd and the amount of labour available should decide the acreage of cotton. The degree of freedom from weed and grass growth also regulates the area—it being much easier to maintain clean tilth on new cultivations than on areas which have been cultivated for years. Generally speaking, the acreage of cotton should be limited to one that can be kept clean and well cultivated under normal conditions.

Where successful results have been obtained regularly it is recommended that the fullest amount of cotton that can be taken care of properly shall be grown, for undoubtedly cotton can yield better returns per acre under favourable conditions than most farm crops. The main point is to select the most suitable soil each season and to plan a system of crop rotations so that there is always an available area in the best condition for cotton growing. Where this system is followed there will be fewer crop failures, the average yield per acre over a series of seasons will be higher, and the cost of production will be less. A greater degree of stability of the whole industry will also be obtained, which is highly important, for a wide fluctuation in the total yield from season to season increases the difficulties of financing, ginning, and marketing.

EQUIPMENT.

When cotton growing was revived in 1920 the crop was produced mostly in the older settled districts where the farms were generally equipped with walking scufflers, one-row planters, and the usual equipment of the small mixed farm. With the expansion of the industry into the newer settlements with larger acreages of soils suitable for cotton, the areas planted by individual growers quickly increased. These growers purchased riding cultivators, two-row planters, three-section harrows, two or more furrow ploughs, &c., and the acreages farmed with such equipment have demonstrated amply how its use lowers the cost of production. It is believed that there should be a more general use of this type of equipment in the older areas, especially in the dairying districts where between the milkings there is only a limited time for farming operations. This is especially true of the wiggle tail type of riding cultivator, with which one man can cultivate 7 to 10 acres a day, as compared to 3½ to 4 acres with the walking scuffler, and, in addition, can do more efficient work, thereby eliminating the necessity for the hoe being used for other than thinning the cotton crop and chipping out odd patches of weeds.

The use of the two-row split-wheel type of combination maize and cotton planter equipped with disc openers is also of decided advantage. A man with a one-horse single-row planter can plant from 4 to 6 acres a day, whereas with a two-horse two-row planter he can plant 10 to 14 acres a day, depending on the speed of his horses and the length of the rows. This is of marked advantage, as over the bulk of the cotton area the spring rains are precarious and frequently planting has to follow a fall of 50 to 60 points of rain. Speed, therefore, is a big factor in obtaining a good germination under such conditions, and the quicker planting is performed the greater the likelihood of success, especially under the drying-out conditions which usually prevail during spring.

Another decided advantage obtained by the use of this type of planter is that the planting is effected more uniformly than with some of the combination planter-cultivators on the market. Having the planting spouts with disc openers just ahead of the wheels tends to insure the spout and the wheel being more in the same plane than where the spout is some distance from the wheel, as in the other types mentioned. The split-wheel appears to be of the utmost importance where planting is effected following a storm of some 50 to 60 points of rain. The packing action of the rims of the wheel on the sides of the seed rather than on the top insures the seed being in firm moist soil and at the same time leaves a loose mulch on top to reduce evaporation. As the weight of the machine and the driver is borne by the rims which press the soil against the sides of the seed, it can be seen that a decided firming of the seed-bed directly under the seed is also accomplishd, which assists in making contact with the moisture of the subsoil.

Where the acreage to be planted is too small to warrant the purchase of a two-row machine, the grower may secure very good results with some of the single-row split-wheel planters. These machines utilise the same principle in covering the seed, but may be somewhat light for obtaining the same pressing effect around the seed. This can be effected by carrying a partly-filled sack of seed on the back part of the frame.

PREPARATION OF SEED-BED.

The variation of the winter rainfall is one of the biggest problems with which the cotton-growers in this State have to contend. It is of the utmost importance, therefore, that the Queensland cotton-grower should follow the most suitable methods of preparation of the seed-bed. In seasons of good winter and spring rainfall successful results are often obtained with indifferent methods, but over a series of seasons it undoubtedly pays to prepare the seed-bed so as to store up the maximum possible amount of subsoil moisture.

The general results obtained by farmers in all districts and at the cotton research station amply demonstrate the value of preparation of the seed-bed before the occurrence of the usual June rains, or as soon thereafter as possible and before the benefit of the wetting of the surface soils has been lost. In experiments at the research station over a series of seasons it has been shown definitely that a gain of moisture equivalent to at least an inch of rain is obtained in the upper 18 inches of soil, simply by ploughing ahead of the June rains instead of late in July and August. Ploughing before June can seldom be done following cotton, however, and this indicates the advantage to be gained by growing cotton in rotations with crops which can be harvested in time to allow early ploughing.

Where cotton is to follow cotton it is strongly recommended that the old cotton stalks be cut off with a slide cutter (plates 3 and 4) similar to that used in cutting green maize. This machine can be made on the farm and requires only a wooden V-shaped slide and two worn-out crosscut saws. These are ground to a knife edge and holes bored through for bolting the blades to the slide. The bushes should be cut right behind the pickers and then raked up to dry and burn as quickly as possible, after which ploughing should start promptly. In this way the winter rains may be conserved to a marked extent, especially if the ploughed land is cross disc harrowed, as this operation firms the bed and yet leaves it in a good condition to absorb the maximum amount of moisture at the occurrence of the planting rains.

Some growers have practised ploughing under the old stalks, but unless this is done early or rather deeply, an open seed-bed exists at planting time which requires more rain than where the stalks have not been ploughed under. The ploughing under of so much easily

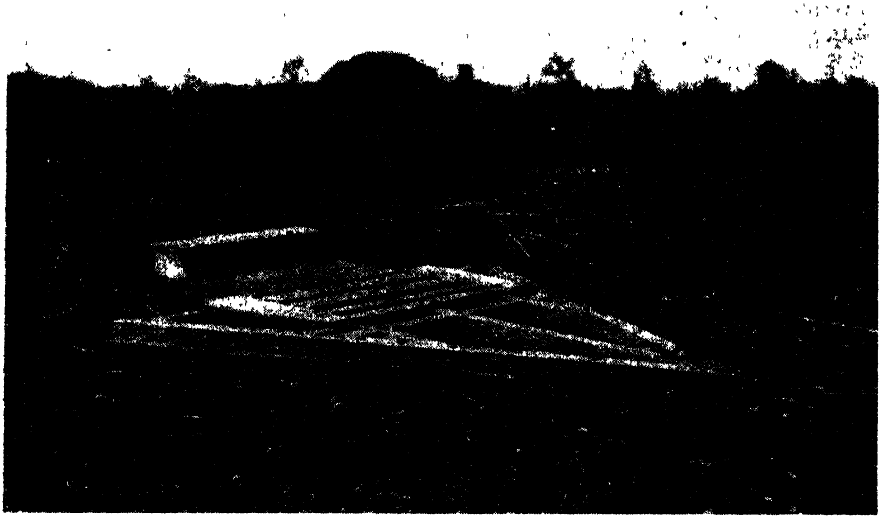

Plate 108.

SLIDE CUTTER.—An adaptation of the old-fashioned maize cutter, for cutting cotton plants. The box at the rear is a guard over two rolling coulters, which serve to steady the machine so that it cuts more efficiently.

Plate 109.

REAR VIEW OF SLIDE CUTTER.—Showing the method of attaching the rolling coulters. These are of decided assistance in steadying the machine, which has a tendency to swing from one row to the other owing to the irregularity of the spacing of the plants.

NOTE.—After the photograph was taken, it was found that a 6-foot blade, instead of three sections of saws, gave better results. Width of saws should clear frame by 8 inches.

Dimensions of machine are as follows:—Length, 10 feet; width at widest point, 7 feet; width of back carriage, 3 feet; length of arms, 8 feet 6 inches; framework, 4 inches by 3 inches (hardwood).

decomposed vegetable matter, especially on fertile alluvial soils, also increases the nitrate content of the soils, and in some districts has enriched them to such an extent that all varieties of cotton tried in recent seasons have made rank growth and failed to produce profitable yields.

Another reason why it is not advisable to plough under the stalks in the Upper Burnett and Central districts is that the pink boll worm attacks the late crop of bolls rather heavily in some seasons. These bolls develop boll rots and are not picked, so the pink boll worms are turned under with the ploughing in of the cotton stalks. Investigations in Egypt have shown that ploughing under bolls containing pink boll worm does not kill the worms, even if the fields are irrigated. In this respect it is advisable to turn the dairy herd into the cotton fields as soon as the crop is harvested, for the cows eat a remarkable lot of the small unpicked bolls and old bolls containing tufts of cotton and diseased locks, thus destroying a considerable amount of insect life.

On new country, or in the first few seasons following Rhodes grass, it does not appear to be so necessary to plough early, as apparently the more open nature of the soil allows of a greater penetration of the June rains. Undoubtedly greater attention should be paid, however, to obtaining early well-prepared seed-beds on old cultivations, for each season considerable acreages are lost, or stands of cotton seriously reduced, through lack of subsoil moisture, although there was ample winter rainfall to supply the same.

DEPTH AND NUMBER OF PLOUGHINGS.

The depth and number of ploughings varies with soil type and climatic conditions. Generally speaking, with the exception of breaking up new cultivations, one ploughing from 5 to 6 inches deep seems to be suitable in most districts. On some of the heavier clay or clay loam soils which tend to set very hard if much winter rainfall is experienced, it is advisable to cross plough early in the spring to loosen up and warm the seed-bed if winter rains have fallen. Late cross ploughing should not be practised if it can be avoided, however, for a lot of moisture is lost with the operation, and in a spring with light planting rains the dry surface soil turned under with the late cross ploughing may not be wet sufficiently to carry the young seedlings through dry spells. Many losses of stand were experienced in the earlier years of this present period of cotton growing, simply because the farmers practised the usual deep ploughing and cross ploughing used in preparing seed-beds for potatoes, sugar-cane, &c. In later years one ploughing of 5 to 6 inches has become more general, and less loss of stand occurs from lack of subsoil moisture.

In general, it is most advisable to plough across a slope on the level contour rather than in a straight line across it or up and down the slope. Studies made in the Callide Valley have shown that contoured ploughing on slopes in the second year after grassland traps all storms recording not over an inch of rain.

FERTILIZERS.

Experiments testing the value of different fertilizers have been carried out over a series of years in different districts and on various soils, but, generally speaking, there has been no clear-cut evidence that there is any economic gain to be realised by using them. The explanation is not clear, but it is suspected that the limited and variable spring and early summer rainfall is responsible for the lack of results from the tests. Similar results have been obtained in parts of East and South Africa, where the climatic conditions are comparable with those in the cotton areas here.

In some seasons the addition of nitrate of soda as a top dressing on either very poor soils or hard, tight-textured black clays of the open plains type has given increases up to 100 lb. seed cotton per acre, which yielded barely an economic gain. Likewise, on some of the older cultivated scrub soils where the potash content is low, increases up to 80 lb. seed cotton per acre have been obtained from applying 1 cwt sulphate of potash, but this again was barely an economic gain.

The most disappointing results have been obtained where superphosphate and rock phosphate have been used in an endeavour to counteract the effect of excessive amounts of nitrates in the alluvial loams. To date no gains have been obtained by applying even large amounts of superphosphate or rock phosphate, either in the drills before planting or as top dressings when the plants were at different heights.

PLANTING SEED.

All planting seed is saved from only the higher grades of pure seed plots of each variety. After the seed is obtained at the ginnery it is first heated at 140° F. to kill all insect life, and a portion of the stocks are then delinted to remove sufficient fibres to allow of the seed being used in "walking stick" hand maize planters in the new scrub burns, and also in ordinary planters equipped with maize plates.

It is strongly recommended that delinted seed be used except where sowing in the dry soil is contemplated. Experiments at the Research Station have demonstrated that with delinted seed a more even distribution is obtained in the ordinary cotton planter, and a lighter rate of seeding can be used—12 lb. of delinted seed giving a germination of 3·7 to 4 plants per row foot, whereas 15 or more lb. of undelinted seed would be required for such a stand. It is recommended, however, that a slightly heavier rate of sowing be used on new cultivations or following fodder crops, for the more open soils will dry out sooner in the upper surface and possibly reduce the amount of germination. A quicker germination is also obtained with delinted seed, as shown in the following data obtained at the Research Station:—

TABLE I.

Seed.	Sixth Day.	Seventh Day.	Eighth Day.	Ninth Day.	Tenth Day.	Eleventh Day.	Twelfth Day.	Plants.
	%	%	%	%	%	%	%	per ft.
Delinted ..	49·1	65·2	69·4	72·4	73·8	75·2	76·3	4·5
Undelinted	7·9	25·7	33·9	40·9	44·9	49·6	52·3	2·0

It is not recommended that delinted seed be sown in dry plantings, for, owing to the ability to absorb moisture better than the undelinted seed, light showers will start germination, and if sufficient rain does not fall the seed will rot, whereas the undelinted seed would be unaffected.

TIME OF PLANTING.

The most suitable time of planting in the cotton districts south of and adjacent to Rockhampton appears to be associated with the soil types. On old cultivations of fertile alluvial loams and clay loams, and on the average of the scrub soils, the best results over a series of seasons have been obtained from plantings made during late September and the first half of October in the Central District, and the latter half of October in the Southern districts. On old cultivations on the heavier clay loam slopes of the forest series plantings up to mid-November can be made with good prospects of obtaining highly profitable yields Likewise, plantings can be made later on new cultivations on all soil types; several instances of early December planting have been reported as having yielded excellently. No advantage appears to be obtained by planting in August or early in September, even if climatic conditions are favourable, for the low soil temperatures retard germination, and later rains chill the young seedlings so much that usually early October plantings catch up with them, and often have a much better stand. In some seasons a very heavy loss of terminals occurs in the early September plantings through insect attacks, while later plantings suffer much less damage.

METHOD OF PLANTING.

Several methods of planting cotton seed are used in this State, all of which give good results when favourable conditions exist. In most districts, however, it is believed that the best results will be obtained by waiting until good planting rains occur, harrowing to make a nice mulch, and then planting with a split-wheel type of planter equipped with disc openers. The harrowing not only warms the soil and thus hastens germination, but also checks an early growth of grass and weed seedlings, which is of marked advantage in reducing the costs of cultivation. Undoubtedly this is an important point and one which is not receiving sufficient attention by many farmers. The harrowing before planting is particularly necessary when cotton follows Rhodes grass, for if not done then the grass seedlings germinate with the cotton and soon require hand-chipping.

Growers planting large acreages of cotton are faced with the problem of getting their crops sown so that they will obtain the fullest benefit from the spring rains. As these seldom occur in more than 2-inch storms, and often lighter, it is frequently impossible to get planted on the one storm unless considerable equipment is available. Some growers therefore plant all their acreage in the dry soil prior to the spring rains; others plant half in the dry and half following the first good rains, while others plant as much as the soil moisture will allow following the first rain, and then wait for further rains to complete their plantings, The latter system is preferable in some respects, for it distributes the future operations over a longer period and thus eliminates a peak demand for a large amount of labour in any of the larger cotton districts. The spring rainfall is most uncertain, however, and it is advisable to take full advantage of any rains occurring. It is believed, therefore, that the system of planting a portion of the acreage in the dry and the rest after good rains occur is the best. The proportions depend on the equipment available. Usually sufficient rain falls to allow of planting for at least three days under satisfactory germinating conditions. By planting in the dry all but the acreage that can be handled in three days it is possible to obtain a highly satisfactory strike over a large acreage from the one rain. It is pointed out, however, that the dry planting should be harrowed as quickly as possible after the rain, in order to eliminate weed and grass seedling growth, especially if the germinating rains do not occur until late October or November. The cotton seed will germinate quickly then, and any delay in harrowing may destroy some of the cotton seedlings. It undoubtedly is advisable to harrow the dry planted portion, for each season witnesses growers increasing their cost of cultivation simply through omitting this early harrowing. Dry planting has drawbacks, however, in that in some seasons much loss of seed is experienced through the spring showers being just enough to germinate the seed, after which there are no following storms to establish the seedlings. In wet springs severe crusting of the heavy soils occurs, often in the dry planted areas, even if harrowing is done, and frequently no strike is obtained or one just good enough to influence the growers to leave it, although the stand is not sufficient to allow of the soil producing the maximum possible yield. The problem is a difficult one, and the general district experiences for each soil type are the best indicators of the merits of each method.

Many growers of small acreages in the older agricultural districts, who have maize planters unsuited for planting undelinted cotton seed, have adopted the practice of opening shallow furrows, sowing the seed by hand, and then covering with either a harrow or scuffler. This system undoubtedly causes loss of moisture and undoes the benefit obtained from an early preparation of the seed-bed. It is suggested, now that delinted seed can be obtained, that where an ordinary one or two row maize planter is available, the plates be modified to make them suitable for planting cotton seed. This can be done by enlarging the holes in the six-holed plates and adjusting the gears to allow of the proper rate of seeding.

The provision of delinted seed is of great assistance to the growers in the newly burned scrub areas, for it eliminates the necessity of treating the seed to make it suitable for using in the "walking stick" hand planters. There may be some danger, however, in sowing the delinted seed in the dry ash before the planting rains occur, on account of the delinted seed germinating with less rainfall than would be the case with treated seed; hence in a spring experiencing light showery conditions considerable replanting might be necessary. It is suggested, therefore, that a grower plant only a portion of his scrub acreage in the dry ash until sufficient experience has been obtained to demonstrate the degree of danger associated with such a practice in each of his soil types.

DEPTH OF SOWING.

The correct depth of sowing varies between 1½ and 2½ inches, depending on the condition of the seed-bed, amount of moisture in the surface soil, and the method of planting. The main objective is to get a good stand as quickly as possible. This requires planting the seed just deeply enough to have sufficient moisture to germinate them, and still not have the soil dry out before the young roots penetrate into the moist subsoil. For most soils under average conditions a depth of about 2 inches in moist, firm soil will allow of a good germination being obtained. This is especially true if a split-wheel type of planter is used. Where the seed is covered by scrapers, or by scufflers if planted in shallow furrows, 2½ inches will probably be better, as the soil is not compacted and there is a danger of the moisture being lost before germination is effected, particularly if drying winds are experienced.

If plantings are made at a greater depth than 2½ inches there is always a danger of the seed rotting in a cold wet spring, and in a dry spring, while germinations may be obtained, the seedlings are frequently so long in coming through the surface that they are thin and spindly and of a pale yellowish colour rather than the usual healthy green. Such weakened seedlings are likely to be attacked by diseases if wet weather is experienced subsequently, and may wither if hot, dry winds prevail for any length of time. Generally speaking, the tendency is to plant too deeply, especially in the plantings in September and early October, when the soil temperatures necessitate quick germination and an early appearance of the seedlings above ground.

SPACING OF ROWS.

A spacing of 4½ feet between the rows is generally used in all the cotton-growing areas. Widths varying from 3½ to 5½ feet were used at first, but experiments and the general experience of growers indicate that around 4½ feet appears to be a fairly good row spacing for most soils over a series of seasons. It is possible, however, that where cotton is being grown on the clay loam forest slopes away from the immediate coastal areas, a spacing of 4 feet or 4 feet 3 inches may be suitable. Usually the plants do not grow so tall on such soils as on the alluvials; hence under moderate rainfall, ample sunlight and air movement may be obtained with the closer distances.

It is not recommended that spacings smaller than these be tried, for with heavy rainfall accompanied by prolonged cloudy weather in February there is a grave danger of a growth sufficiently rank being made to create dense shade. Experiences of past seasons have indicated that such conditions are conducive to insect attacks, accompanied by heavy losses from boll rots on the lower portions of the plants

CULTIVATION.

It is recommended strongly that proper attention should be given to the cultivation of the cotton crops during the early stages of growth. The general tendency is to wait until the plants are 4 to 5 inches tall before the first cultivation is made. In most seasons considerable development of pigweeds and summer grass will be present by then, especially when early showers are experienced, and it will be nearly impossible to destroy all such growth without hand labour, even with the most efficient cultivators. This not only increases the cost of production needlessly; but, where only light rainfall has been experienced, moisture has been robbed from the soil around the plants which should have been conserved by careful mulching and clean cultivation. The practice at the Cotton Research Station is to harrow after the rain before planting and cultivate close to the row as soon as the seedlings are 2 or 3 inches high, using a riding cultivator equipped with tines 2½ inches wide, and guards to prevent the soil covering the plants. This eradicates all weed and grass seedlings, establishes a nice mulch around the plants, and helps to prevent any further growth of weeds in the row. If rainfall is experienced before thinning time, it will be necessary to cultivate again, especially on old cultivations, otherwise this can be avoided until the thinning is done. A careful cultivation is given after thinning to re-establish the mulch between the rows and around the plants. This should be done as soon as possible on account of the removal of much of the mulch in the row during "chopping" operations, as the thinning with a hoe is termed.

Generally speaking, not more than three or four cultivations should be required after the one immediately following the thinning if cotton is grown in rotation with Rhodes grass; on old cultivations as many as ten may be required. At each of these operations it is recommended that the soil be worked to the plants, for not only does this help to control weed and grass growth but a firm brace is established around the plants which assists in preventing them from being blown over during severe storms when the soil is wet.

The greatest efficiency should be obtained in the cultivation operations. For most districts it is recommended that the best work can be done with the two-row cultivator of the type in which the driver steers with his feet the carriage on which the tines are fastened, rather than depending entirely on being able to guide the horses. There are several makes of this type of machine on the market, all of which can be equipped with tines, sweeps, duck feet, and in some cases discs. By using such a type of machine not only can better work be done close to the plants, thereby avoiding the necessity of much hand hoeing of the crop, but a greater acreage can be cultivated in a day, thus reducing the cost of production in two ways.

Plate 110.

Illustrating efficient cultivation. The plants in the foreground are velvet bean seedlings, which are very brittle, yet with the equipment being used no damage was done to them. The soil is of a clayey nature and the cultivating is being done three days after a heavy downpour.

It is advisable to continue the cultivation as late as possible, for with the beating nature of the usual mid-seasonal storms, a very large amount of the rainfall runs off the compacted soils, especially in the older cultivations. Soil moisture determinations at the Research Station in 1932-33 demonstrated that following a long dry spell a storm of 2·94 inches—occurring in two falls, one late in the evening and the other early next morning—failed to increase the moisture content of the soil in the 4 to 6-inch level on non-mulched old cultivation. Late cultivation must be maintained to allow of as much penetration of storm rains as is possible to obtain. With a one-row scuffler very tall cotton can be cultivated by using long traces and a spreader close behind the horse, with the ends of the spreader wrapped with hessian to protect the branches of the plants. Little damage is done in tall cotton cultivated in this manner, and the destruction of weed growth and establishment of a mulch in the "middles" is of marked assistance in developing the late middle crop of bolls in an ordinary season. If the last cultivation is made when the surface soil is dry and crusted enough to break up in clods, it will be all the better for retarding the run-off of storms.

HEIGHT OF THINNING.

The question of what is the proper height of plant at which cotton should be thinned is very important under Queensland conditions, for with the light rains that are often experienced in the spring, competition for moisture becomes very acute in unthinned cotton. On the other hand, several different insect pests attack the terminals of the cotton seedlings early in their growth and the growers are loath to thin too early, especially in seasons when cutworms are present in large numbers, for fear of losing their stand of well-formed plants after thinning.

Experiments conducted at the Cotton Research Station, while yielding varying results, indicate that thinning when the plants are 6 to 8 inches tall can be expected to yield better than do later thinnings. Apparently thinning at this height is conducive to the formation of fruiting branches low on the plant, which allows of the early flowering, setting, and maturing of the crop. Indications have also been obtained that there is a tendency to produce more five-locked bolls, thus increasing the average weight of boll per plant.

Many cotton growers are dairying as well, and therefore have but limited time between milkings for field work. It is believed, where a large acreage is being grown and the thinning has to be done without employment of labour, that it is better to start operations when the plants are 4 to 6 inches tall, for this is the easiest height at which to thin, and the chances of completing the thinning before the plants are too tall will be increased. The same suggestion applies where labour is employed by contract thinning in the large areas. Thinning when the plants are from 4 to 8 inches tall enables the men to cover a greater acreage a day, and thus allows of the cost of thinning being kept at an economic level.

METHOD OF THINNING.

Opinion is somewhat divided in Queensland regarding the necessity of thinning. Some growers maintain that a light planting of delinted seed, which the ordinary cotton planter distributes fairly uniformly spaced in either singles or scattered bunches—a 9 to 10 lb. rate of sowing averaging from 2 to 3 seed per row foot—gives satisfactory results. Others sow about 15 lb. of delinted seed and then cross-harrow when the seedlings are 3 to 4 inches tall, which tends to knock out thick bunches and leave a fairly uniformly spaced thin stand. Most of the growers believe, however, in thinning out to wider distances with the hoe, and where this is done a greater rate of thinning could be accomplished if more attention were paid to the use of the right type of hoe. One frequently sees heavy chipping hoes with clumsy, twisted sapling handles used in thinning or "chopping" cotton. It is difficult to do skilled chopping with such an implement, and it is recommended that a light type of goose-neck garden hoe be used instead. Not only can the strokes be guided more accurately when using the lighter hoe, but they can be made with much less fatigue, which will result in a greater acreage of chopping per day.

The angle of the set of the blade to the handle of a hoe is most important, as a hoe suitable to a tall man is not at all suitable to a short one, for in chopping cotton the art lies in cutting off the plants cleanly at the surface of the ground with the least effort. A blade set at too acute an angle tends to split the stalks rather than cut them off cleanly, while, if set too close to a right angle, it tends to enter the soil too deeply and requires very accurate guiding. The cutting edge should be kept well sharpened with a file, especially on the corners, which play a very important part in skilled chopping. Greater attention to what may appear to be minor points undoubtedly increases the efficiency of cotton chopping.

Experiments have been carried out with a cotton thinning machine of the oscillating chopping blade type, but not very successful results have been accomplished with it. Cultivators equipped with discs have also been tried and have given fair results. Machines similar to low two-wheeled orchard cultivators have been designed in the United States, and reports indicate that up to 20 acres a day can be thinned out in bunches by cross cultivating with them. Where an orchard cultivator with 8-inch duck feet is available, it should be experimented with, for any machine which will thin the plants into bunches spaced to the distance desired reduces the cost of thinning appreciably, as a final stand of one plant per bunch is then cheaply obtained with a hoe.

DISTANCE BETWEEN PLANTS.

The best distance to space the plants when thinning depends, broadly speaking, on the height they are likely eventually to reach. Where the plants generally grow to a height not exceeding 3 feet, they can be left closer together than where they normally grow to 4½ to 6 feet tall. Unfortunately, variable seasonal conditions affect the results obtained at all spacings, so that the best distance to space the plants narrows down to the one giving the greatest factor of safety in each soil type under a wide range of climatic conditions. This varies with varieties—those of more open habit of growth standing closer spacing than the ones with large leaves and coarser vegetative development. Generally speaking, however, 12 to 18 inches can be depended on for the spacings on the soils where the more open plant growth is made, while 18 to 24 inches appear to do better over a series of years where taller growth is generally experienced. Closer spacings on the poorer soils may sometimes produce heavier yields, but there is always a danger of the size of the bolls and quality of the fibre being affected by moisture shortage during dry periods of high temperatures. Undoubtedly a lot of weak and wasty fibre is produced each season through the growers not spacing out their crops sufficiently to enable the plants to withstand adverse conditions

Another point against spacing too closely is that under excessively wet mid-seasonal conditions rank growth is likely to develop in all varieties on many of the cotton-growing soils of this State. Such growth is accompanied nearly always by excess shade, which is very attractive to various kinds of insects injurious to the cotton crops. Most of these pests either destroy the bolls or puncture them so badly that internal boll rots, which are also increased under conditions of shade and high humidity, attack the crop and cause either entire loss of the boll or serious staining and weakening of the fibres. An open airy surrounding for each plant is highly desirable under Queensland conditions, and the spacing problem is to obtain this to the fullest extent without sacrificing too much row space between the plants. It is recommended, therefore, that the abovementioned distances be used for the general spacing until it can be ascertained if others are more suitable for the particular type of soil being used.

HARVESTING COTTON.

The harvesting of cotton is the most expensive item in the production of this crop, and the way in which the crop is harvested has a decided effect on the quality of the lint produced.

One of the most important points to observe is that cotton should not be picked either when it is wet from exposure to rain, or when it is green, as fibres are called before the bolls have been open long enough to allow the fibres to dry out thoroughly. Not only is it difficult to clean leaf and trash out of cotton in either condition, but during the ginning operations the saws cut the wet fibres very badly, and also tend to leave them in a twisted, ropy state. Lint of this nature is easily detected, and the buyers penalise it heavily, for much waste is obtained from such cotton during the spinning operations. Picking may be done while the dew is still present, but the cotton should be spread out in the sun to dry during the forenoon, after which it can be baled with the rest of the picking of the day. It is not necessary to dry the cotton which is picked after the dew is off, providing "green" cotton is not included.

PRESERVING THE "BLOOM" OF THE CROP.

Another important point when harvesting cotton is to guard against leaving the cotton exposed too long to the weather. Cotton, when the bolls first open, has a nice richness of colour, or "bloom" as it is termed, and it is necessary for a sample of cotton to have this "bloom" before it can be graded into the higher grades of the regular universal standards, although it may be free of trash. When cotton is left unpicked for several weeks the bloom is lost through the bleaching action brought about by the nightly wetting with the dews and the subsequent drying by the sun. This changes the colour to a chalky dead-white and also destroys the lustre of the fibres. The effect of storms on cotton is worse than the dews—the colour is changed to a dull greyish tinge, and even to a light bluish tinge when rains lasting several days are experienced. When rains do occur cotton should not be picked until several days of sunshine have been experienced, in order that the dews and sun may bleach out the stains, and the wind and heat fluff out the fibres from the matted condition caused by the rain. This greatly improves the appearance of the lint, and raises both the lint and seed cotton at least a half-grade. A benefit is thus obtained in two ways by delaying picking after a storm until the cotton has improved in appearance—the cotton is of greater value, and no payment is made for picking moisture.

EFFECT OF HIGH WINDS.

The picking of cotton also should not be delayed too long on account of the effect of strong winds. With the continuous movement of the plants in windy weather the locks tend to hang out of the bolls in a long, stringy condition. This not only allows the cotton to dry out excessively, thus losing weight and adversely affecting the character of the fibres, but also makes the seed cotton difficult to gin properly, owing to a considerable proportion of the locks being in a twisted, rope-like condition which gathers up bits of broken bracts and leaves in windy weather, especially if severe frosts have occurred. It is difficult to clean such trash in the ginneries, for the smaller pieces are generally twisted in amongst the fibres. In addition to these disadvantages, much greater loss of crop on to the ground occurs in wind-blown cotton during heavy storms than where picking is done at proper intervals. It can be appreciated, therefore, that cotton should not be left unpicked too long. Where the harvesting is done by the grower and his family it will pay to make several pickings in a good crop, depending on the season. Where labour is employed it has to be remembered that sufficient bolls must be open to allow the picker to make a reasonable tally, otherwise the cost of picking necessarily will be higher. Generally speaking, it has been found satisfactory when employing labour to make one good picking and then a clean-up in fields of light to medium yield, and two pickings and a clean-up in good crops.

HOW TO PICK.

Picking can be done best by using both hands working independently of each other, but guided by eye each time. This enables one to fill both hands before emptying into the sack and saves an amazing number of movements during the day. Generally a sack is strapped around the waist so that the weight of the cotton is on the ground and the mouth of the sack hangs open, thus enabling the cotton to be put in quickly. With the modern cleaning machinery installed at the ginneries it is not necessary to pick only clean cotton, for a certain amount of the bracts, the leaf-like parts surrounding the boll, may be included, provided they are not in twisted cotton, as they are removed in the cleaning machinery before the cotton is ginned. The amount of stained cotton should be kept to the lowest minimum, however, for the stained fibres are much softer and weaker and are cut up in the ginning, while their colour lowers the value of the rest of the lint. The hard, diseased locks should not be included, for these are so much waste for which the grower pays picking charges, and the Cotton Pool pays freight—the grower thereby losing in two ways. Cotton containing these hard locks has to be graded low, for a certain amount of the softer diseased ones are ginned with the good cotton, thereby lowering the value and thus making a third loss to the grower.

The most difficult matter to remove from the cotton lint is grass and weed seed, especially spear grass seed, and every effort should be made to clean the fields at the last cultivation so that no seed will be produced. On old cultivations, even where good farming practices have

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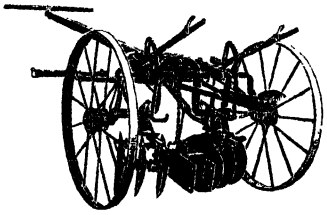

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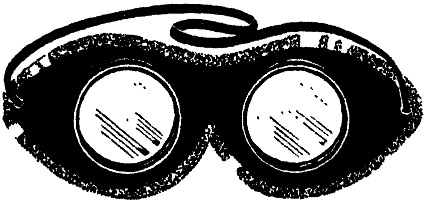

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been followed, there is always danger of tall-growing weeds in the rows setting seed late in the season, and it pays to chop out such weeds before the harvesting commences, especially if pickers are employed.

SNAPPING.

Cleaning machinery is installed at the Glenmore and Whinstanes ginneries for treating snapped cotton. Snapped cotton is obtained by snapping or jerking the whole burr and contents from the plant, and should be practised only after heavy frosts have been experienced. Snapping unfrosted bolls tears the plant badly, and the cotton when packed in containers for forwarding to the ginnery "sweats" so that it is difficult to clean and gin. In addition to this, freight is paid for the green sappy burrs, leaves, and portions of the plant instead of light, dead material. Snapping undoubtedly lowers the grade of most of the mature cotton of high quality to the point where the full value of the lint cannot be obtained. On the other hand, snapping the top crop of bolls, which usually contain cotton of lower quality, not only does not lessen the value materially, but enables a considerable amount of cotton to be harvested cheaply which would often not be picked in the ordinary manner. Only bolls containing marketable cotton should be snapped, however, for the dry, hard diseased bolls, or "hickory nuts," as they have been termed, contain no cotton, and are removed in the cleaning machinery before the seed cotton is weighed, while the weak and wasty fibres of partially developed bolls are so badly gin-cut as to lower the quality of the whole bale. Under no circumstances should wet or even damp-snapped cotton be forwarded to the ginnery, for only lint of the lowest grades can be obtained from it, as the big pieces of moist bracts become so entangled in the fibre that the cleaning machinery cannot remove them. Snapping is of value to Queensland cotton growers, but should be used properly.

PACKING COTTON.

Owing to the distance of the cotton fields from the ginneries in Queensland the crop is forwarded by train either in bags or wool packs containing around 80 to 100 lb. and 500 lb. of seed cotton, respectively. The growers of small acreages generally use second-hand chaff-bags, &c., while those with more than 5 or 6 acres usually purchase once-used wool packs for their crop. It is cheaper to use the wool packs, for grower's individual ones are returned for a small fee which covers cost of freight and heating to kill the pink boll worm or any cotton pests in them, whereas the bags are not, and thus represent a loss to the grower.

CLEAN CONTAINERS NECESSARY.

Before filling a container it should be cleaned carefully to remove everything that might affect the grade of the cotton, and wool packs which have had cotton in them should be cleaned especially in order to protect the purity of seed. Growers should pay particular attention to this feature, for undoubtedly much contamination of pure seed varieties can be brought about by admixture caused through bits of seed cotton sticking in the corners of bales and being attached to strands of the sewings along the edges.

UNIFORMITY OF GRADE IN EVERY BALE.

When packing a container every care should be taken to have only the one grade and staple of cotton in it. A bale of lint is sold on the basis that it contains cotton of uniform grade and staple length. If there is any variation of content encountered it is purchased on the basis of the lowest grade and shortest staple contained. It is most important, therefore, that growers should pay careful attention to forwarding containers with uniform contents, and it is strongly recommended that some effort be made to grade the cotton before putting it into bags. Usually two, and in some fields, three grades should be ample, for with the exception of droughty spots or places of rank growth, the quality of the crop over a field, if picked in a short time, is more or less the same. By having a bale each for good grade; leafy cotton; and cotton which is insect stained or from droughty parts in the field, a grower, especially with a large acreage, would not only obtain the full value of his crop, but would be forwarding containers of uniform contents, thereby assisting the industry generally.

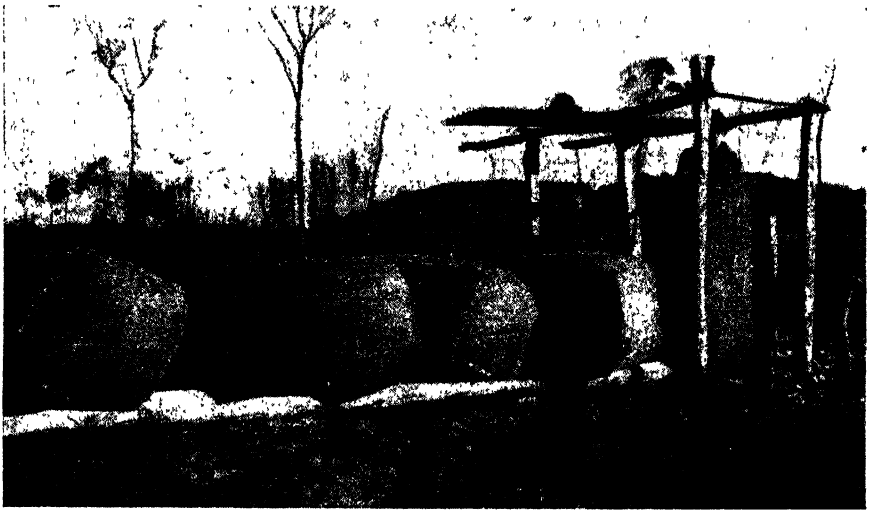

Plate 111.

PACKING COTTON.—A baling centre in the field. A once-used wool pack is suspended by plain fencing wire and the cotton tramped in until approximately 500 lb. weight is obtained.

FORWARDING COTTON.

Every grower has a registered number, and should include this with his initials and railway station in a brand for identifying each container he sends. The brand should be placed in a conspicuous place on the side of the container in black that will not rub or wash off. Each season a number of wool packs are received at the ginnery which have no identification marks, or on which the brands are so indistinct that they are not legible, and it is only through checking up the advice notes which a grower despatches to the Cotton Board when forwarding his cotton that the ownership can be established. This slows up the work at the ginnery, and should not occur.

GRADING.

When the container of seed cotton arrives at the ginnery the contents are examined by a grader, who first determines the grade. "Grade" means a combination of the colour, body, and strength of the cotton and the amount of trash or foreign matter in it. The grades used are based on the Universal Standards for American cotton, which are recognised in all official cotton exchanges. The grader determines next the length of the fibres, or staples it, as the operation is termed. Each container is then weighed and checked against the amount of cotton the grower states on his advice note to the ginnery, after which it is segregated into the proper stack for ginning according to the grade and staple. When the cotton is being ginned two samples are drawn from each bale of lint in such a way as to represent the true contents. These are sent to the classing room, where another grader staples and grades them against a set of lint standards, which are based on the key set of Universal Standards for American cotton that is obtained from the United States Department of Agriculture, every time new reference sets are prescribed. The true contents of each bale of lint are thus determined before delivery to the spinners. The lint grader is also advised of the grade and staple of each container of seed cotton from which each bale of lint is obtained. This enables him to check on the classifications of the seed cotton grader throughout the season and thus ascertain if the seed cotton is producing lint of the quality that has been estimated before it is ginned.

GINNING.

The product obtained from the open boll is composed of seed and fibres, and is called seed cotton. It is necessary, therefore, to separate the seed from the fibres before the latter can be spun into yarns of various kinds, and the process used in effecting the separation is called ginning. The basic principle of all ginning establishments or ginneries, as they are termed, is first to remove as much trash, dust, and other foreign substances as possible by various cleaning machines, and then to separate the fibres from the seed. There are two kinds of ginning machines—roller and saw. The roller gin consists of either one or two long leather covered rollers which revolve at slow speed and pull the fibres between a fixed knife pressing on one roller, and a stripper bar which tends to push the seed out of the fibres as they are drawn through by the rollers. This form of ginning is used mostly for the very fine diametered long staple Sea Island, Egyptian, and similar types of cotton, as owing to the slow ginning the long fibres can be removed from the seed without damaging them. The American Upland cottons and similar types are ginned on saw gins which have a much greater output for a given time and therefore greatly reduce the cost of ginning. The saws of this type of gin closely resemble the ordinary circular wood saw, only the teeth are of finer width and mounted at an angle which points them in the direction in which they revolve. The saws are usually 10 or 12 inches in diameter and 70 or 80 of them are mounted approximately five-eighths of an inch apart on the one spindle. A steel half-circular grid slotted to match the spacing of the saws is mounted so that the teeth of the saws just show through on the concave side of it. This grid is part of a cylinder into which the cotton drops after being cleaned, and as the saws revolve and remove the fibres from the seed a rolling motion is imparted to the seed cotton which forms it into a big core of seed and seed cotton. This is called the breast roll and is of marked assistance in the ginning, for as the locks of seed cotton are fed into the cylinder, the breast roll presses them against the saws, which insures uniform removal of the fibres from the seed. An air-blast blows the fibres from the saw teeth into a condenser, whence they are fed to hydraulic presses for baling. The resultant bales are enclosed with a hessian covering and then bound with heavy wire ties, the average bale weighing 500 lb.

OIL MILL OPERATIONS.

The cotton seed separated from the fibres are important to the cotton industry, in that they are the source of several valuable by-products which are obtained in the oil mill. When the seed arrives at the oil mill it is covered with dense short fibres called "linters." These have nearly as many varied uses as have the long fibres or lint removed in the ginning operations. Among the more important, are their use in making motor-car upholstery, felts, medicated cotton, and after being treated chemically, as a source of supply of cellulose for the manufacture of high explosives and artificial silk. Large quantities are used annually throughout the world. All foreign matter is first extracted from the seed, and the linters are then removed by delinting machines which resemble the ordinary gins used to remove the cotton fibres. The delinted seed are next hulled to remove the seed coats, after which the kernels are rolled or "flaked" and cooked to release the oils. The cooked meal is then spread in a thick layer between cloths made of camel hair and pressed in hydraulic presses to extract the oil. The residue is in the form of a hard slab called "cake." After the cloths are taken off, this is ground into fine golden coloured meal. which is a valuable concentrated stock food of high protein content that is used in large quantities in dairying countries where "hand feeding" is practised. Unfortunately, the value of cotton seed meal has not been sufficiently realised by Australian dairymen, and a large proportion of the meal has been exported as "cake" during good seasons in past years. In the 1936-37 drought, however, the supply of meal could not meet the demand, and it is to be hoped that in the future a greater regular use of this meal will be made by dairymen. Cotton seed meal is also a valuable sheep feed, and for this purpose it is pressed into cubes so that the sheep can be fed in the paddocks without loss of meal. A quarter of a lb. of cubes a day with some roughage keeps the sheep in good condition, and such feeding has been the means of saving thousands of sheep during very dry years. Cotton seed meal is also a valuable food for pigs, calves, and horses when fed in proper amounts. Information should be obtained from the Department of Agriculture and Stock for the correct feeding of these animals.

When the cooked kernels are pressed, a fatty oil is obtained which, after it is refined, is used in the manufacture of margarine, toilet soaps, and for cooking oils. Practically all of the Australian requirements for cotton seed oil are supplied by the Queensland Cotton Board.

From even this brief outline of the oil mill operations it can be realised how valuable are the cotton seed and their by-products, and what an important part they have in the economic life of a community. It is mentioned in this respect that approximately 7,000,000 tons of cotton seed are crushed annually throughout the world. It is especially important to a pastoral country like Australia that large supplies of cotton seed meal be produced locally, and it is to be hoped that a greatly increased use of such a suitable concentrated stock food will be practised when its value is more fully realised.

MARKETING.

The whole of the Queensland cotton crop is handled each season through a compulsory Cotton Pool, which is managed by a Cotton Board composed of one elected cotton grower from each of the six districts into which the cotton areas are divided, and a representative of the Director of Marketing of the State Department of Agriculture and Stock. As soon as a grower places his cotton on rail the Pool takes possession and pays all transportation, ginning, and marketing costs. The growers, through a Co-operative Association, own their ginneries for ginning the crop and the oil mill for treating the resultant seed, thus ensuring to them the full value of their crop.

When a consignment of cotton arrives at the ginnery it is graded and the poundage of each grade and staple length is obtained, for which a first advance is paid to the grower, which usually is an estimate of 80 per cent. of what the average basic value of the crop will be, plus a premium for the grade and staple if his cotton is above the basic value, and any bounty paid by the Commonwealth Government. As sufficient moneys accumulate from the sale of the crop, further advances on a flat rate per pound of cotton are paid to each grower until the sale of the crop is completed.

The sale of the crop in Australia is made direct to the spinners by the Cotton Board, so that no commissions are paid other than those to overseas brokers selling any portion of the crop not required in Australia. Under this system the grower is assured of his crop being ginned and marketed to the best advantage for him. Charges are eliminated wherever possible, and the costs of operation more than bear comparison with those of other countries working with labour charges similar to those of this country.

YIELDS.

Cotton, in common with all other crops that can be grown in the cotton-growing districts, is subject to fluctuations in yields caused by various factors. Adverse climatic conditions, unsuitable soils, incorrect cultural methods, wrong varieties and insect attacks, all affect the yield obtained from a crop of cotton. Generally speaking, however, where the right combination of variety, soil, cultural methods and climatic conditions exist, good to excellent yields are obtained over much of the south-eastern portion of the State. As the growers become more experienced and further progress is made in solving the problems connected with soil investigations, developing improved stocks of the best varieties and combating insects, which in some seasons cause serious damage in some districts, the general average yield will undoubtedly be raised. As it is, the average of the better growers over a series of years is 700 lb. of seed cotton per acre or higher, according to climatic and soil conditions. In good seasons yields of 1,200 to 1,500 and occasionally 2,000 lb. seed cotton per acre are obtained by the best of the growers in many of the districts. The problem confronting all concerned in the industry is to ascertain and adopt methods which will produce yields each season in keeping with those now obtained by the better growers. Undoubtedly much progress can be made in this respect if all growers pay greater attention to the points which have been touched upon, for the suggestions offered are based on the methods used in producing the higher yields, and on the results which have been obtained from investigations carried out at the Cotton Research Station and in the different cotton districts.

It has to be realised, however, that failures occur in every agricultural crop that is dependent on rainfall. Although the cotton crop may fail when exceptionally adverse conditions are experienced, the general results that have been obtained indicate that cotton is about the most reliable crop that can be grown in many of the districts which are suited to its production.

COTTON VARIETIES.

The varieties of cotton grown in Queensland are all of the Gossypium hirsutum type, the botanical family which includes the American Upland cottons. During the American Civil War the long stapled Sea Island cotton was grown along the Brisbane, Albert, and Logan Rivers with some success, and following the World War, Egyptian varieties were tried, but without satisfactory results. The Sea Island classes are luxury cottons to-day, and it is only in countries with highly suitable climatic and economic conditions that they can be grown, and even there restriction of acreage is practised in order to obtain profitable prices. The Egyptian cottons likewise require special economic conditions, and do best under irrigation in arid climates.

It is believed, therefore, that the American Upland cottons are by far the most suitable for Queensland. The climatic and soil conditions in most of the cotton districts here are similar to those ruling in many parts of the cotton-growing areas of the United States, where the bulk of the American Upland types are grown. Likewise, these cottons with their larger bolls and coarser fibre can be picked and ginned much cheaper than the small boll, fine diametered fibre types, which is an important point, for the cost of production is one of the main problems connected with growing cotton in this country.

The most suitable variety of cotton to grow depends so much on soil type and climatic conditions that it is suggested the reader had best enquire of the nearest Cotton Officer, Department of Agriculture and Stock, for the particulars concerning his individual conditions unless he is in a one-variety district. A full description of the soil type, original timber, and cropping history should be forwarded, for rather pronounced differences in suitability of varieties exist in many districts.

PURE SEED SUPPLIES.

The responsibility of developing supplies of seed of suitable varieties of cotton for the different districts of the State is vested in the Department of Agriculture and Stock through legislation, passed with the approval of the representatives of the growers at the end of the period of Government guaranteed prices in 1926. A Departmental staff had been organised to develop suitable varieties during the period covered by the guaranteed prices, and it was believed at the termination of the period that it was desirable the Department should continue to have sole control of the pure seed operations. The aim of the Department has been to organise the districts on the basis of one-variety communities, wherever possible, producing cotton of the highest quality that the conditions would allow. Under this scheme several varieties producing fibre ranging from $1\frac{1}{16}$ to $1\frac{1}{8}$ inches full were developed to supply suitable cotton for export, and then later, as the knitting industry developed in Australia, modifications were made to meet the local requirements. In recent years a demand for cottons ranging from $\frac{7}{8}$ to $1\frac{1}{8}$ inches has arisen, and stocks of seed of several varieties of this type are now available for general distribution. Unfortunately, varieties of this class have shown a marked preference for definite soil types and climatic conditions, and growers should obtain information from the Department concerning them. A large number of varietal tests have been conducted by the Field Staff of the Cotton Section to ascertain the requirements of each variety, and it is possible to supply a grower with a reliable cotton that produces lint of the type demanded by the Australian spinners.

Cotton is an easily cross-pollinated plant, hence it is essential that rigid precautions be taken to reduce all chances of contamination between varieties. It is necessary, therefore, to isolate fields producing seed for planting purposes by at least a half a mile from other cotton and on soil where cotton was not grown in the previous season. Likewise, the greatest care has to be taken at the ginnery to prevent an admixture of seed in any of the operations connected with stacking the containers of seed cotton, ginning, heating the seed to kill insect life, and delinting the planting seed. It is obviously advisable, therefore, to have only the minimum number of varieties necessary to meet all requirements, and wherever possible, to develop a district on the one-variety basis. This is being attempted in all cotton-growing countries, for it has been demonstrated that it is not only advantageous in maintaining the purity of a variety, but also in developing cultural practices, and in marketing the crop.

Unfortunately, any variety of cotton will deteriorate rather rapidly unless the purity of the type is maintained by carefully conducted breeding operations. It is necessary, therefore, to develop a system of seed replacement in every variety grown, whereby in each season pure stocks can be made available for distribution. The system which has been developed in Queensland aims at sending to the oil mill each season all seed that is in more than the fourth year of multiplication after being released for general distribution. By this method it is hoped to maintain a high standard of quality in each variety.

VARIETAL TESTING.

Before a newly introduced variety or a strain of an old established variety can be released for general distribution it is necessary to test it against the varieties already grown commercially to ascertain its merits. Many growers think this can be done by planting single plots of from 1 to 5 acres of the new variety and comparing the yield with that of their general crop. The experiences of all countries have demonstrated, however, that carefully conducted tests over a series of seasons, and on different types of soil, are necessary before the merits of a variety can be fully determined. A field staff has therefore been developed in the cotton section of the Department of

Agriculture and Stock, to assist growers wherever possible, in conducting varietal and strain tests in the main cotton-growing districts. Plans of properly laid out experiments are also sent to growers in the smaller isolated districts, to enable them to test varieties in a manner which will give them reliable results. Each season a considerable number of such tests are arranged, and the results obtained have been the means of determining the most suitable varieties for a large number of individual growers, and for several of the main districts.

Plate 112.

TESTING FOR STRENGTH AND DROUGHT RESISTANCE IN A BIG BOLL VARIETY.—Each season thousands of plants are examined by the cotton section of the Department of Agriculture and Stock, and upwards of 2,000 plants are picked individually for further inspection in the laboratory. Progeny rows of the plants selected finally as worthy of further study are planted in the following season in breeding blocks, where the uniformity of plant and fibre characters is carefully studied. The most promising progenies are kept for further increase and trial. In this manner suitable strains are being developed of the main varieties now being grown.

RESEARCH AND ADVISORY ACTIVITIES.

A member of the Field Staff is stationed in each of the largest cotton-growing districts, to conduct varietal tests, allot pure seed increase plots, carry out cultural and fertilizer investigations, and advise growers on general cotton matters. Another important duty of the field staff is to test out the findings obtained in the investigations carried out at the Cotton Research Station and to develop modifications of them to suit the range of conditions existing in each district.

The work conducted at the Cotton Station, which is in the Callide Valley, the largest cotton-growing district, includes a wide range of studies embracing varietal testing and breeding of cotton, and other crops used in crop rotations; cultural practices, and their effect on the composition of the soils; soil moisture studies; and entomological problems. Wherever possible, problems arising in the cotton districts

are studied at the station, and marked assistance has been obtained from the work carried out there in explaining the causes of some of the difficulties that have been experienced in many of the cotton areas.

CONCLUSION.

This article has been prepared to convey a general idea of the cotton-growing industry in Queensland, and to present suggestions bearing on the most important features to be studied in the growing of this crop. These suggestions are based on the voluminous amount of data and observations that have been collected from the results obtained at the Cotton Research Station, Biloela, and from the investigations conducted by the Field Staff and the Graders. Further details regarding the major aspects can be obtained from the Cotton Section of the Department of Agriculture and Stock, Brisbane, or from the nearest Cotton Field Officer stationed at Rockhampton, Biloela, Monto, Mundubbera, and Kingaroy.

◆

AN EMERGENCY CROWBAR.

A very efficient crowbar can be made from an old double-ended pick head, a large size gate hinge, and a stout handle of spotted gum or similar wood. The diagram shows how these are utilised and held together by two stout bolts. This tool will be found most useful when sinking post holes.

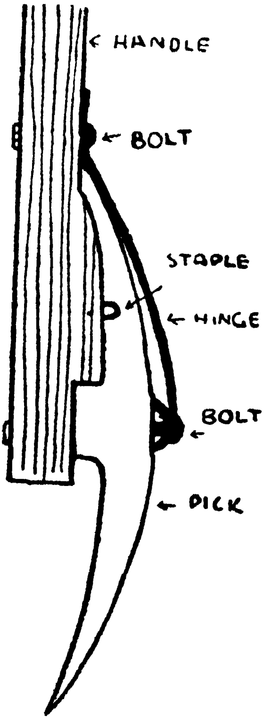

Plate 113.

Spraying and Jetting of Sheep.

JAMES CAREW, Senior Instructor in Sheep and Wool.

THAT south-western Queensland is capable of producing high-quality merino sheep was made evident by the fact that, during my recent tour of this area, I noticed a big improvement in the young sheep. This may be due to some extent to the good season; but, apart from this, quality and character were showing up very prominently.

At Yamburgan some good-quality young rams were seen. This property has been improved considerably during the last few years and what was, a few years ago, thickly timbered and practically waste lands has developed, as a result of ringbarking, into well-grassed areas capable of maintaining five sheep where previously one could not live. At Noondoo also the flocks now are showing more size and stronger constitutions, and assuredly this will increase the wool yield per head. Needless to say, much forethought and good management is necessary, and this must be backed up with new blood of improved quality and selected to suit the flock.

Difficulties are met with, and these can be surmounted only by grim determination and a knowledge of the most satisfactory methods to adopt. When good seasons come they bring with them a big relief so far as the pastures are concerned; and these were manifest in the large areas of Mitchell grasses which, although dry, resembled waving wheatfields. These good seasons also bring a heap of troubles to the sheep owner in the form of the dreaded blowfly. Where large numbers of sheep are to be protected, this is no mean task and needs to be undertaken in anticipation.

Under the Spray.

Mr. Young, the general manager, was leaving little to chance on the day we arrived at the yards. A large flock of ewes, shorn two months previously, were being put through under the spray which takes the place of a plunge dip to control lice in sheep, and which, owing to its arsenical content, also assists in controlling fly strike.

In the application of this method, the sheep are enclosed within galvanised walls about 8 feet in height, the structure being 50 feet in length and 9 feet 6 inches in width. The bottom is composed of battens which are made in sections to fit from wall to wall, and four feet wide, the battens being placed ½ inch apart to allow for a speedy getaway of the surplus spray. Under this battened floor are 10-feet lengths of corrugated galvanised iron which have a fall to the side where a deep guttering is placed just outside the wall. The 10-feet length allows for the iron to project outside the wall at the low side. There are two galvanised iron gates—one at the entrance and another 25 feet away or in the middle of the enclosure.

The spray fittings are fixed to 1-inch water piping and placed in two rows overhead on cross bars. The mixture is measured into a tank to which a power pump plant is attached, and is pumped into the spray system, which sprays over the sheep for eight minutes. The closer the sheep are packed the better, as the mixture is forced into the skin which it follows, giving a fairly thorough soaking. When completed the iron gate in the middle of the enclosure is opened and the sheep allowed to go forward into the other half of the enclosure. While they are going forward the iron gate leading to the yards is opened, when the sheep to be sprayed will follow readily those which already have been sprayed. The centre gate is then closed and the spray section of the enclosure filled. While these are being sprayed the sprayed sheep are draining and the drip caught by the iron under the floor is drained into the guttering and back through a strainer into a receptacle from which it is used again. Ewes heavy in lamb can be treated by this method without risk, and it is estimated that 8,000 sheep per day can be dealt with.

In another yard sheep with longer wool were held for jetting as a protection against fly strike. In this case the sheep were run through a race in which a cage was placed. This cage is fitted into a frame to allow it to swing or partly revolve, securing the sheep in the cage with its hindquarters fully exposed to allow a thorough jetting.

There is a big difference between spraying and jetting, as the former is sprayed on in a fine shower, while jetting is forced through a nozzle at high pressure—say, from 60 lb. per square inch for short-wooled up to 160 lb. or even over for long-wooled sheep. Care and judgment is necessary, the skin being easily damaged with this high pressure. The recognised strength of an arsenical dipping or spraying mixture is ·2 per cent. arsenic, while for jetting it varies from ·2 to ·8 per cent. in keeping with the regulations.

A PROFITABLE LITTER.

The litter of twelve large white pigs, bred by Mr. M. G. Bayliss, Kinton Stud, Maleny, and check-weighed by the Department of Agriculture and Stock, made a very creditable weight.

Farrowed on 22nd May, 1937, the pigs were from Highfields Pear 29th and sired by Highfields Hardshot 3rd.

The total litter weight at eight weeks old was 446 lb., the average being 37·1 lb.

Type Classification of Pigs.

This article has been abridged from a pamphlet—" British Pigs for Queensland Farms "—issued by authority of the Hon. Frank W. Bulcock, Minister for Agriculture and Stock.

THE farmer desiring to embark in the pig raising industry must give careful consideration to the question of breed characteristics and trade types before coming to a definite decision.

Pigs are usually classed into two trade types, namely, porkers and baconers, and even breeding stock are distinguished as being of the porker or baconer type according to their size and rate of maturity, the smaller and more compact pig being classed as a porker type and the larger and more rangy pig as a baconer type. There, of course, is an intermingling of these two types, and when an extreme bacon type is mated with the extreme pork type the resultant progeny usually are intermediate in type.

With this knowledge we can say that, in general, the Berkshire and Middle White breeds are of the porker type because of their compact structure and their tendency to fatten and provide a "finished" carcase at porker weights, namely, from 60 to 100 lb. dressed. It must be realised, however, that this is merely a general classification of these breeds as a whole and not of every individual animal within the breeds, for a big variation will be found in the types of individuals. Thus, some pigs of the Berkshire and Middle White breeds could be classed as bacon types.

BERKSHIRES IN AUSTRALIA.

England is the home of Berkshire pigs, and from the herds of Great Britain Berkshires are sent to many parts of the world to form new studs and to strengthen studs already established. In Australia the Berkshire is the most prominent among our several breeds of pigs, being found to adapt itself to a wide range of climatic and economic conditions.

The greatest use of the Berkshire pig is made where the breeder wishes to supply a porker market, and breeds Berkshires pure or crossed with other porker type pigs, or where it is desired to produce a medium type pig such as a heavy porker or light baconer from 100 lb. to 120 lb. dressed weight by crossing typical Berkshires with pigs of the extreme bacon type.

There are some very lengthy Berkshires which, if bred pure and carefully fed, will produce a good light bacon carcase. These pigs are the extreme rather than the average of the breed, but it is important for breeders to realise that such types do occur within the breed.

Breed Characteristics.

The typical British Berkshire is a blocky and symmetrical pig, well covered with flesh, and standing on comparatively short legs, showing reasonably fine bone. The head and face of a good Berkshire should be neither too small nor too large in proportion to the size of the pig, the nose being moderately short and the face slightly dished. The jowl should be light and neat.

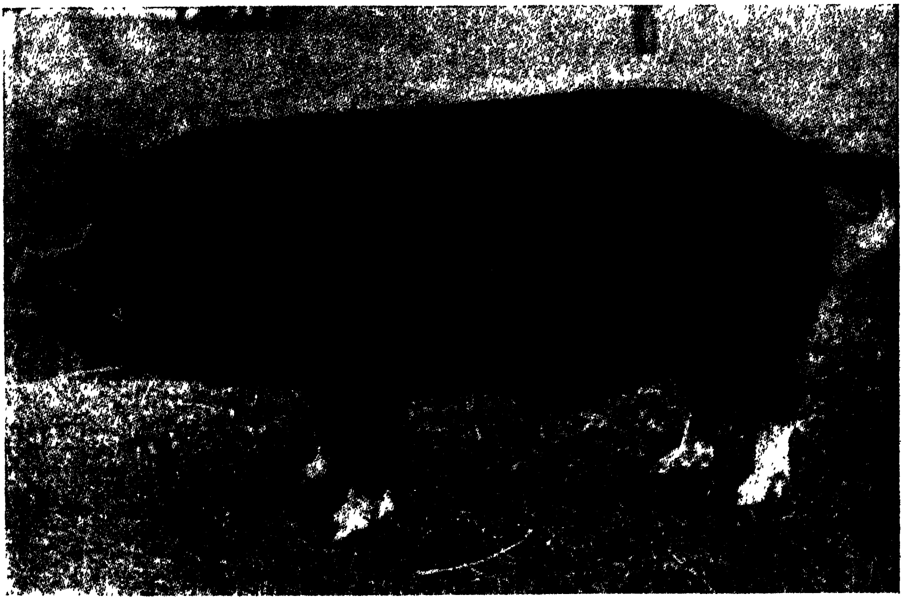

Plate 114.

Burnham Prim Boy, sire of the imported boar, Burnham Griqua Baron, whose pedigree is shown herein

The neck should be of medium length and not too thick, running smoothly into the shoulders, which should be broad enough and deep enough to provide good chest room, but they should not be excessively developed on the sides or top, the shoulders and fore parts of the pig being of low relative value to the butcher and consumer.

The back should be long and slightly arched to give strength. The ribs should spring from the spine, giving a flat back—but not too wide. The sides should then be flat and deep, carrying down straight to give a strong, thick "streak" in the carcase. The loin should be well developed and the hams should be broad, deep, and well-filled in between.

The legs should be relatively short, with fairly fine bone; and they should be placed well apart "at the corners of the body." Legs which are bent or which are placed in underneath the body are undesirable. The feet should be compact and strong.

Both boars and sows used for breeding purposes should have a good number of well-placed and well-developed teats. Twelve or more are usually considered a satisfactory number. As a boar will affect the teat number of his progeny, it is important that he, too, should be well teated.

In general appearance Berkshires should show character, masculinity in the boar and femininity in the sow, quality combined with size and vigour. They should be well-balanced and free from deformities of any kind.

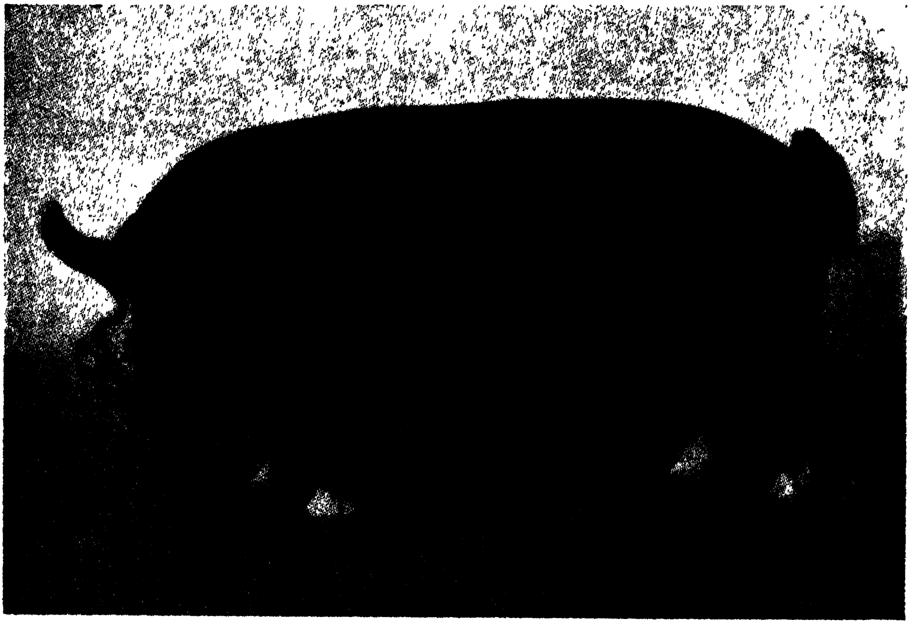

Plate 115.

Dringhouses Resolute, sire of the imported sow, Chapel Rosary, whose pedigree is shown herein.

Early Berkshire breeders fixed as their standard colour of the breed black with white points, i.e., white on the four feet, the face, and the brush of the tail, and this is the standard colour as set down by the breed societies fór the present-day Berkshires.

It is well known to those who have had the handling of Berkshire pigs that the standard of colour and markings as set down for the breed is rarely attained, and it is a very difficult matter for breeders to get the exact marking which they require in the breed. Even when well-marked pigs are bred from, the progeny usually show some variation from the ideal marking seen in the parent stock; but it must be understood that there is more chance of getting well-marked pigs by mating boars and sows which are well marked than by mating those which are badly marked. While the breeder of Berkshires wishes to pay attention

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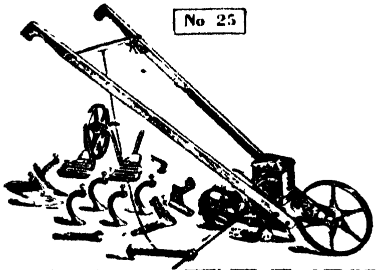

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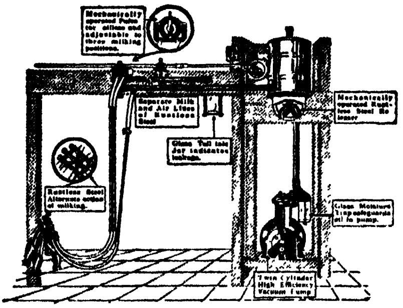
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to the breeding of well-marked animals, he must not neglect other characteristics such as conformation, quality, and productiveness, which, after all, are the most important features of any breed of pig. It should be borne in mind that pigs are used primarily to produce pork, and it is often necessary for both the stud breeder and the show judge to overlook slight faults in the markings of the animals. So far as it concerns the farmer who is using Berkshire pigs for the production of pork and bacon, the colour markings count little, and the more important characteristics are productiveness, type and quality.

THE MIDDLE WHITE PIG.

The Middle White, also sometimes referred to as the Middle Yorkshire, was founded in Yorkshire, England, by the judicious selection and mating of native and introduced stock, the objective being to evolve a medium type of pig for the production of quick-maturing porkers.

Plate 116.

Fulford Wink, dam of the Middle White boar, Lancefield Gentleman, who was mated to the imported sow, Wratting Patty 3rd, prior to her leaving England.

The Middle White is more compact than the Large White—in fact it closely resembles the Berkshire in general type, but typical pigs of the breed usually have a shorter and more turned-up nose than average Berkshires.

The Middle White pig is used particularly in the production of light-weight porkers or for crossing with larger-type pigs for the production of heavy porkers or light baconers.

The breed has a well-earned reputation in the porker class at Australian shows, and Queensland breeders are familiar with its successes in these classes at Brisbane shows. Middle Whites made a very successful display in the porker carcase competition conducted at the Brisbane Abattoir some years ago, when pigs of this breed won first and second prizes.

The fine bone and fine white skin of the Middle White porker make it a very attractive carcase which the butcher is always pleased to handle. In addition to its carcase qualities the Middle White is a good farmer's pig, being extremely docile, and the sows are usually excellent mothers and very prolific.

When Middle Whites are mated with Tamworth or Berkshire pigs the white colour is dominant, and the resultant progeny are mostly white.

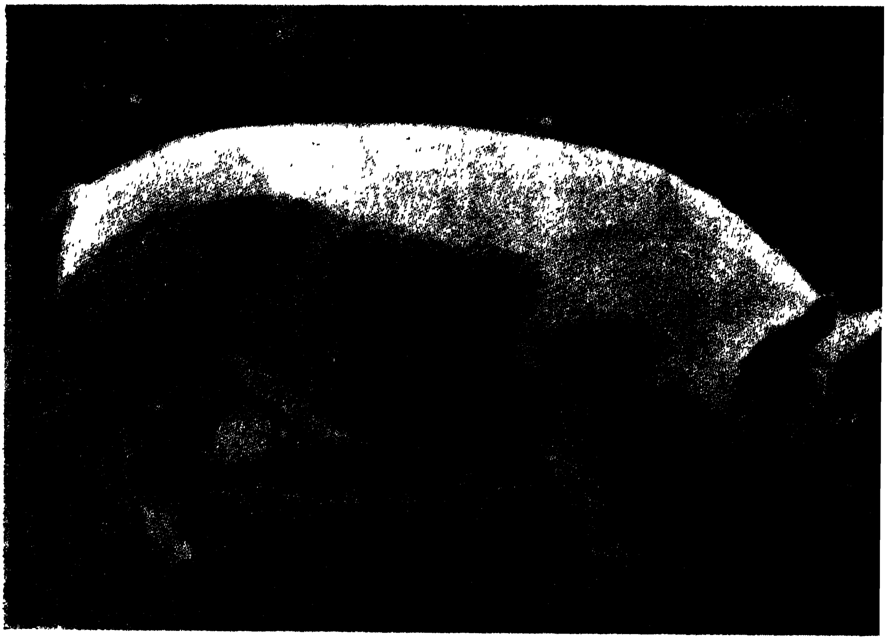

Plate 117.

Watford Gracious Lady, dam of the imported sow, Watford Gracious Lady 37th, whose pedigree appears in this booklet.

Breed Characteristics.

The colour of Middle Whites should be:—Pinkish skin, free from black or blue spots, and a coat of white hair free from black hairs. The nose should be somewhat shorter than that of the Berkshire, but the head and jowl should be light in proportion to the body. The shoulders and neck should be neat and light, the back slightly arched and long. The ribs should spring out to give a flat back, but should then descend to give a straight, deep side and full underline.

The hams of the Middle White should be large in all directions. The legs should be comparatively short, strong, and straight, being set on the outside of the body, not close together or sloping in under the pig. The feet should be compact and strong. At least twelve well-developed and well-placed teats are desirable in breeding stock.

The Middle White should be compact but not dumpy, and show plenty of character and vigour in its action and general appearance.

Hardiness of Middle Whites.

Whilst criticism is sometimes levelled at white-skinned pigs on account of their so-called "softness," we see them bred successfully from the south coast to the far north of Queensland, and even in the inland districts, with excellent results, and experience has shown that white pigs can hold their place with the dark-coloured provided they are given reasonable attention and kept free of lice and mange by oiling should the necessity arise.

Details of the pedigrees of the imported pigs of the Berkshire and Middle White breeds, which were selected by the best available judges in England, and are said to represent the best of the British herds, can be obtained from the Department of Agriculture and Stock, Brisbane.

REARING PIGS WITHOUT THE SOW.

Newly-born pigs are frequently deprived of the sow's care through death or sickness, or because the litter is too large. If taken in hand as soon as they are deprived of the sow's milk there is a very good chance of the pigs being reared successfully by artificial feeding. If they are left too long without sufficient food, however, they become weakened and difficult to rear.

Sometimes a large litter is divided into two lots, and each lot is put with the sow separately for a drink at frequent regular intervals. Although this entails a lot of attention, it gives satisfactory results. Foster mothers are sometimes available, and a sow with a small litter may be given some pigs from another sow, provided they are about the same age as her own.

When hand feeding is resorted to the pigs should be given a warm, dry camping place, and have access to clean pasture. A movable shed in the run is very convenient. In the absence of the sow's milk, which helps to build up a natural resistance to disease, every possible precaution should be taken to prevent infection in the young pigs. A clean and comfortable pen should be a first consideration. Access to pasture assures a supply of vitamins and minerals, which are essential to a complete diet.

A method of feeding which has given very good results with pigs taken from the sow when a day or two old is as follows:—Start the pigs on whole cow's milk fed warm and as fresh as possible, six times daily. After three weeks the whole milk may be gradually replaced by separated milk, and the six feeds daily may be reduced gradually to three feeds daily. When the change from whole to separated milk is being made, a trough of a dry meal containing 90 per cent. of pollard, bran, maizemeal or wheatmeal, and about 10 per cent. of meat-meal should be kept in the pen with food always available to the pigs. This trough must be sheltered and kept dry. A constant supply of drinking water should also be kept before the pigs when they are given the dry food.

In teaching the young pigs to drink, the bottle and teat are neither necessary nor desirable—a shallow dish serves the purpose well. The warm milk should be placed in the dish about ½ inch deep, and the pigs taken one at a time and stood in the dish. Then if the pig is held firmly over the top of the neck its head can be placed down into the milk and held there long enough for it to get a taste of milk, but not long enough to allow it to inhale the milk. This operation may be repeated a few times at each feeding. After two or three such lessons the piglets will usually drink readily without assistance and afterwards will give little trouble.

When the piglets are drinking well the dish may be replaced by a shallow trough. Both the dish and the trough used for holding the milk should be made of metal or earthenware and free of cracks so that they can be cleansed and scalded after each meal. This is most important for the prevention of digestive disorders.

—*L. A. Downey, Instructor in Pig Raising.*

The Rearing of Chickens.

J. J. McLACHLAN, F.B.S.A., Poultry Inspector.

THAT the rearing of chickens is one of the most vital subjects in poultry-farming is a statement the truth of which will be conceded generally. To be successful in that industry, a flock of well-grown birds, suitable as future breeders, must be raised annually. Although the parent stock may be quite typical, their offspring will be an unknown quantity until maturity is reached and, during their development, they can be made or marred by good or bad management.

In preparing for the arrival of the chickens, first consideration must be given to the housing of them. The use of a laying house is preferable to the building of a special brooder house. The latter would be used only for about four months each year, and to that extent the farm would be over-capitalised. On the other hand, a laying house need only be empty for about four months every two years.

When an old laying house has to be used, care should be taken to put it into a perfectly sanitary condition. If the floor of the laying house is of concrete, burning with a blowlamp will give good results. At the same time it would be as well to make sure that the woodwork is free from external poultry parasites, such as mites or ticks. The woodwork should be painted with creosote. Should the building have an earth floor, the best method of putting it in a good, sanitary condition is to remove a few inches of the earth, replacing it with fresh earth, making sure that the level of the floor is at least four inches above the level of the surrounding land. Care should be taken to see that the drains around the building are deep enough to carry off all flood waters, because chickens cannot live and thrive on damp or wet floors.

If an old building with a netted run attached is used, it will be a decided advantage to turn over the soil and plant some crop. This should be done as soon as the pen is empty of fowls, and if Japanese millet were planted, the chickens would have ample greenstuff, and at the same time be able to eat the grain, by which rearing costs would be lightened.

If second-hand brooders are used, they should be put into a sanitary condition, and for this purpose a blowlamp should be used, as heat will be more effective than disinfectants.

Two Systems of Brooding.

There are two systems of brooding—the heated and the fireless. Brooders that supply the chickens with artificial heat will give better results on the average. Different types of battery brooders, usually heated, also are coming into prominence. With these machines, the chickens have a very restricted run on a wire-netting floor for about four weeks, after which they are placed on the ground in a house. The feeding and drinking utensils should be cleaned, and, if possible, disinfected in the same manner as the brooders.

Having everything in readiness, and in a good sanitary condition, the question of the number of chickens to be reared in each unit has to be considered. It is advisable to keep chickens in small units—preferably in lots of 100, with a maximum number of 200 under one brooder. If using a laying house that is to accommodate 100 layers, a temporary division of netting should be run down the centre, and 125 chickens put in each section. From this it may be anticipated that the necessary number of pullets would be raised.

Just before the arrival of the chickens, the floor should be covered to a shallow depth with litter such as chaff, sawdust, shavings, or any similar material. Under the brooder an opened-out sack on which sand has been sprinkled may be placed, this material being preferable to litter in heated brooders on account of fire risks. The brooder should be warmed up for a couple of hours prior to the chickens being placed in them.

When the chickens are under the brooder, they should be restricted to a distance of about 6 inches around it. This is best done by circling the brooder with wire-netting. They should now be supplied with clean, cool water. The vessel should be of a kind that permits ample drinking space for the chickens and, at the same time, does not allow them to get wet. Coarse sand and shell-grit should be provided in small trays. Another essential is wood charcoal, and this should be provided in a granulated form in trays. The water, grit, and charcoal should be available to the birds at all times throughout their life.

Feeding Methods.

So far as feeding is concerned, the usual practice is to place the chickens under the brooders direct from the incubators, and to withhold food from them until the next day. The kind of food and method of feeding have an obvious influence on rapid growth.

In my opinion, the all-mash system of feeding dry in troughs will give the best results. An all-mash that has proved suitable is as follows:—Maizemeal, 40 lb.; bran, 20 lb.; pollard, 20 lb.; dried buttermilk, 10½ lb.; meat and bone meal, 7½ lb.; fine salt, 1 lb.; cod liver oil, 1 lb. This ration gave excellent results in experiments conducted by the Department of Agriculture and Stock, and since then the majority of commercial poultry farmers have adopted this method, or are feeding ready-mixed all-mashes based on the experiments mentioned. By placing the mash in shallow troughs, with a piece of netting fitting loosely inside the trough on top of the food, wastage is prevented. It is a good practice to put out only a small amount of mash, and, on each visit to the chickens, to add a little more This will encourage the chickens to consume more mash, and thus make rapid growth.

To lighten work in this direction, it will be found more convenient to have a kerosene tin of mash in each pen; then the "little and often" practice of feeding will not be neglected. A big factor towards the success of dry-mash feeding is the provision of ample feeding space.

During the first week troughs about two feet long by six inches wide and 1½ inches deep will be ample for 100 chickens. Afterwards the troughs should be about three inches deep and from four to eight feet in length from the second to the sixth week. The length of the hoppers has not been increased in accordance with the rapidity of the growth of the chickens, because it is expected that farmers will commence removing the cockerels as soon as the sexes can be determined.

The ration mentioned is for those persons who are compelled to purchase all foodstuffs. In the event of farmers having suitable food stuffs available, these should be used to advantage. For instance, if milk is available, the dried buttermilk could be eliminated from the ration. In feeding milk, it is best given in the form of dry curds—that is, with the whey strained. Liquid milk adheres to the feathers, and when the chickens are under a heated brooder it gives off a sour odour, and the fact that special care must be given to cleaning the vessels containing milk is my reason for preferring to feed curds.

As soon as the chickens have become accustomed to feeding, green feed can be supplied. The greens should be young and succulent, as foods of a fibrous nature are quite unsuitable for young chickens.

In the daily routine work, for the first week the brooder lamp should be kept burning; this should apply also on wet or cold days. In working with lamp brooders, it is a wise policy to place a windbreak, such as a sheet of iron, in front of the brooder each night to prevent ground draughts. After the second night, the droppings must be cleaned up every morning, and the sack cleaned and sprinkled with fresh sand. The water vessels should be cleaned out daily, a piece of sacking or brush being used for this purpose.

Care should be taken to avoid spilling water on the floor where chickens are being reared. This can be done by washing out and filling the drinking vessels outside, and carrying them into the pens. Again, if the floor around the drinking vessel gets wet, a frame having a netted top might be made to cover this wet patch, and the drinking vessel placed on it. Wet places on the floor are spots where disease organisms and worm eggs can be picked up, and this danger should be guarded against.

Daily Routine.

The daily routine work must be carried out carefully, the mash and greenstuff being supplied constantly. The grit tins should be kept well filled and an ample supply of clean, cool, fresh water always available, the vessels being kept cleaned out thoroughly.

The brooder lamp must be filled, and the wick trimmed, care being taken to clean off all the carbon from the wick and burner. The gauze below the wick must be clean always, as this regulates the amount of air admitted into the burner, and should this be choked up with dust, the lamp may commence smoking, and would be liable to catch on fire.

During the first week, the chickens should be confined fairly close to the brooder, to teach them where the warmth is, but after that they may be permitted as much liberty as possible. A good run is decidedly beneficial to them.

After the first week, the brooder lamp can be put out in the morning, and relit at about 4 or 5 o'clock in the afternoon, according to climatic conditions. When the chickens are about three weeks old the weaning process may be commenced by reducing the flame gradually so that, when there are only from four to five, there is no need to light the lamp. This is a simple and satisfactory method of weaning them in heated brooders. It is wise to leave the brooder and lamp in position, as the chickens then will camp under the hover. If the hover is removed. they will be liable to crowd. For that reason the chickens should be trained to use the perch before the brooder is removed.

When the chickens have learnt to perch at about six weeks of age the feed can be changed from the all-mash ration to a growing mash and grain. The following is a growing mash that can be fed in conjunction with equal parts of wheat and finely-cracked maize as the evening meal:—Maizemeal, 25 lb.; pollard, 40 lb.; bran, 20 lb.; meatmeal, 5 lb.; linseed meal, 2 lb.; dried buttermilk, 4 lb.; bonemeal, 2 lb.; fine salt, 1 lb.; cod liver oil, 1 lb. A liberal supply of young, succulent, chaffed greenstuff should be given as a midday meal. This ration could be continued until the pullets are about sixteen weeks old, when a change should be made to the laying mash.

Losses through Sickness.

More chickens are lost annually as a result of chills than from all other causes put together. Even in the case of chickens dying from specific diseases, it probably is true that 90 per cent. of the deaths originated in chills which first weakened the birds and laid them open to other diseases. No treatment can be recommended except the exercise of care in keeping the chickens warm and encouraging them to eat more food, although the supplying of a little milk to drink might strengthen them.

Another annoying trouble is cannibalism, which may take the form of toe-pecking or tail-picking. These vices may be attributed to shortage of food and inactivity. Affected birds should be removed, and the affected parts painted with Stockholm or coal tar. The birds should then be put in a dark place for about half an hour before being returned to their pens. To prevent further outbreaks, their attention must be directed away from the vice. Ample litter must be placed in the pen. In cases of toe-pecking, shavings or chaff should be used. The toes of the chickens will sink into such materials. For tail-pecking, straw should be placed in a heap in the centre of the pen, and the chickens will be so occupied in spreading it out that they will forget their bad habit.

A CLOTHES TROLLEY.

This trolley, which the housewife will find most convenient for taking clothes to the line on washing day, can be made from a large packing case and two old perambulator wheels. The axle is the only article to be bought. Buy a length of round iron from a blacksmith and get him to put a thread on each end. Shape two long boards for the sides as in the sketch, and when these are joined with two shorter pieces to make a shallow box connect the ends of the shaped pieces with part of an old broom handle. The large compartment, which has holes drilled in the floor to let the water out, is for the clothes, and the smaller one for pegs. Crossed legs are fitted on either side, and the wheels are attached to the ends of the pair which come from the back, or handle end. A length of galvanised piping, or a long piece of wood with a hole bored through the centre, keeps the wheels in their place on the axle, and a nut on each end secures them on the other side.

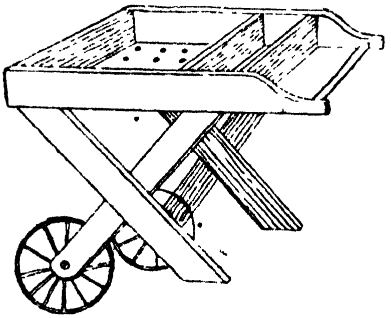

Plate 118.

History of the Australian Sugar Industry.

IN an interesting paper on "The History of the Australian Cane Sugar Industry," read before the Historical Society of Queensland recently, Mr. F. C. P. Curlewis, general secretary to the Australian Sugar Producers' Association, traced the first record of the growth of sugar-cane to India 600 years prior to the Christian era. In 327 B.C. the first European reference to it was made by Nearchus, an admiral of Alexander the Great, and subsequently its production went through Persia, Arabia, and Egypt, and later to Spain and Portugal. The Chinese also were acquainted with the sugar-cane in the very remote past.

Some sugar-cane plants actually were brought to Australia by ships of the first fleet in 1787, having been shipped at the Cape of Good Hope. Nothing, however, was heard as to the cultivation of sugar-cane in Australia until about 1822, when Thomas A. Scott established a plantation near Port Macquarie, and (in 1824) manufactured a few tons of sugar, as well as some rum.

It is interesting to note that, precisely 100 years later (in 1924), Australia first entered into the overseas export trade in sugar. The cultivation of sugar spread to the northern rivers of New South Wales, plantations and mills being established on the Bellinger, Clarence, and Richmond Rivers in the late sixties of last century.

First Queensland Planting.

The first record of the cultivation of sugar in what is now Queensland was in 1836, when an East Indies planter named Mayo planted a few acres near Brisbane with cane which had come from Mauritius. It, however, was not until the sixties that an attempt to manufacture sugar by Thomas Bowden, in the vicinity of Brisbane, is recorded.

In 1862 John Buhot, who is said to have gained his experience in Mauritius, actually succeeded in making sugar from cane grown in the Brisbane Botanic Gardens. The available appliances were crude in the extreme, and it is said that actually the sugar was made in a domestic saucepan.

In the following year Captain the Hon. Louis Hope had 20 acres under cane at Ormiston, near Cleveland. It was there that the first sugar mill was built, and commenced operations in 1865, the first ton of sugar from the mill being sold by auction in January, 1866. During the visit of members of the International Society of Sugar Cane Technologists in September, 1935, Captain Hope's title as the father of the sugar industry in Queensland was recognised by the formal dedication of a monument to him on the site of the old mill.

Sugar-cane was introduced in the early days from Java and Mauritius, and some years later several varieties were brought from New Guinea by Mr. H. Tryon, an officer of the Queensland Government. One of these varieties (Badila) has played an important part in many of our canefields since.

As the outcome of encouragement given by the Government, nearly 2,000 acres had been taken up in 1865 under what were known as the Sugar and Coffee Regulations, but it was not until 1867 that the manufacture of sugar was regarded as a commercial enterprise.

Sugar Cultivation Spreads.

By 1870 no fewer than twenty-eight sugar mills were operating in Queensland, mostly in the Albert and Logan districts, and developments gradually spread northward to the Mary and Burnett Rivers, later reaching Bundaberg, Mackay, and Ingham, and subsequently the Johnstone River, Cairns, and Mossman in the late seventies and early eighties.

As many as eighty-three mills had been established by 1880, most of them in Mackay and adjacent districts, the total output of sugar for that year being 15,564 tons. The greatest number of mills operating at one time was 166 in 1888, with an output of 59,000 tons of sugar. Of these, only twenty-two were established in the northern districts—that is, from the Burdekin district to Mossman—because, as the industry developed in the northern areas, the policy of larger mills with separately-owned cane farms, rather than attached plantations as the source of supply, was being recognised as a surer method of opening up and populating North Queensland.

Co-operative Control.

During the early eighties a strong agitation against the employment of kanaka labour in the canefields was carried on, and in 1885 Parliament was petitioned for Government assistance in the establishment of central mills, one of the arguments used being that only through the agency of farmer-owned manufacturing plants would it be possible to make canegrowing a white man's industry. As a result, sugar mills were erected at North Eton and Racecourse, in the Mackay district, for which £50,000 was advanced, and provision made for its gradual repayment. Under the terms of the Sugar Works Guarantee Act passed in 1893, central mills were built in eleven centres scattered along the coast from Nerang to Mossman.

After many vicissitudes the whole of these, with the exception of Nerang, are working still. Half a million sterling was advanced by the Government at that time as loans to the farmers in the respective districts. The farmers lodged their deeds as security for the repayment of principal and interest, and the loans were to be repaid over a period of fifteen years. In the event of default, the State Treasurer was entitled to enter into possession of the sugar works as well as of all the lands mortgaged, and to fix the price of cane.

The Mackay District.

The farmers' co-operative mills system received a greater impetus in the Mackay district than elsewhere and prior to federation Mossman (1897), Mulgrave (1896), and Proserpine (1898) were the only central mills established north of Mackay. The main reason for this, of course, was that conditions of living, in those early years, were less attractive to permanent settlers than those obtaining in Mackay and Bundaberg. Later on, when new sugar districts were required, they were all opened up north of Mackay, and co-operative central mills were established at Babinda, south of Cairns, and at South Johnstone and Tully, south of Innisfail.

When Federation became an accomplished fact, a "White Australia" was accepted as a definite policy, and adequate protection was promised to the sugar industry. A duty was imposed by the Commonwealth Government on imported sugar, and an excise duty on sugar manufacured in Australia; and from this excise a rebate was paid on all cane produced by white labour. By 1907 most of the kanakas had disappeared and, from then on, the industry, under white labour conditions, was faced with regulations and awards in respect to wages and the general conditions of the employment and accommodation of the workers. The first award by an Industrial Court was made in 1914. Incidentally, there were strikes of a more or less serious nature; but, viewing the subject as a whole, it may be said that, whilst the wages awarded by the Court appeared to be unduly high, they eventually attracted a class of labour that has contributed, not only to the efficiency of the industry, but also to the satisfactory type of settler and settlement that has spread through the north-eastern littoral of Australia.

Regulation of Cane Prices.

Seeing that the employees had secured protection by means of industrial awards and regulations, it was not long before the growers supplying both proprietary mills and central mills put in a claim for some method of determining, under statutory authority, the value of their cane. For this purpose the Regulation of Sugar Cane Prices Act was passed by the State Parliament in 1915 and, under its provisions, a tribunal was created with final authority to allocate to each mill the lands from which it should draw its supply of cane and to determine the value of the cane delivered to the mill. This tribunal, known as the Central Cane Prices Board, consisted of a Judge of the Supreme Court, one representative of the millowners, and one representative of the canegrowers, and it is the final board of appeal from the decision of Local Boards that primarily determine values in respect to the cane delivered to each mill. The system then inaugurated has been in force since 1915 and, on the whole, it can be said to have been satisfactory.

Effects of the War.

On the outbreak of war in 1914 the Commonwealth Government immediately placed an embargo on the export of sugar from Australia. Simultaneously, the State Governments, through their price-fixing authorities, took steps to keep the price at normal levels. The result was that the sugar industry did not share in the high world prices that fell to the lot of the established exporting industries. Australia was not producing enough sugar at that time for its own requirements, and importations had to be made at values that, as a result of the war, reached £98 per ton and averaged over £40 per ton, whilst the Australian raw sugar was made available at £21 per ton. The only labour procurable in the country at that time was costly and unreliable, and prices of capital and consumption goods were high; consequently, by the end of 1919, the sugar industry was in a really bad way. Due to the necessity for importing sugar, the Commonwealth Government had taken complete control of the industry so far as distribution and the fixation of prices were concerned, and strong representations were then made as to the serious position to which the industry had fallen. The result was that, in 1920, the Commonwealth Government agreed to place an embargo on the importation of sugar and to increase the price of sugar over a period of three years to such a figure as would enable the industry to get on a sound footing again.

This increased price gave a definite fillip to the industry, and the revival that followed was maintained when, at the expiry of the first agreement, it was renewed as regards conditions, though the price of raw sugar was reduced by about 11 per cent. About this time the Commonwealth Government relinquished direct control of the industry, and all its subsequent economic conditions have been regulated under an agreement between the Government of the Commonwealth and the Government of the State of Queensland, whereby the Commonwealth on the one hand agrees to impose an embargo on the importation of sugar, whilst the State Government agrees to provide sugar at such a price as will enable the consumer to obtain it at a definite price over a term of years. These agreements have been renewed from time to time, and the price to the consumer remained at 4½d. per lb. for many years, but a reduction to 4d. per lb. was secured by an amended agreement in 1932. Recently this agreement was renewed until the crop of the season 1940 is disposed of.

Export Market.

After the renewal of the third series of these agreements, about 1925 or 1926, it was realised that great developments were taking place in many sugar districts—that production had overtaken consumption and that there was likely to be a surplus every year, necessitating the securing of an export market. This special market was created, almost coincidentally, by the policy adopted by Great Britain of granting preferential treatment in import duties to Dominion products. Hence, the industry entered upon export trade at low values, but with the definite knowledge that it would have to be limited, first, by the reduction created in the average value of the Australian crop; and, secondly, by the preferential requirements of Great Britain. This idea has been haunting the leaders of the industry for many years, and steps have been taken to control production, with the result that, under present conditions, any increase is due chiefly to favourable seasonal conditions, though extra efficiency in production, both in field and mill, is responsible for some of the present output of sugar. The increased production, of course, has added to the employing capacity of the industry and, consequently, there has been a natural reluctance on the part of Governments to create any more unemployment by statutorily reducing production.

Under the International Sugar Agreement finalised in May, 1937, as an outcome of a conference of the principal sugar-producing and consuming countries of the world, Australia is limited to an annual export quota of 400,000 tons and, in addition, the British Government have intimated that they will introduce into Parliament a measure providing for the maintenance of the present preferential duties on Empire sugar. These two factors introduced some stability in the industry, and the limits of our production are now definitely known.

Modern Machinery.

With the passage of time methods of cultivation, crushing, and transport have progressed steadily from the primitive to the most up-to-date. When, in 1916, wages began to assume a heavy item in production costs, an impetus was given to the development of labour-saving devices, such as weeding machines, and cane planters, &c., and, with the introduction of tractors, the use of heavier field machinery was made possible. Now, on the larger farms, it is usual to find two- and three-disc ploughs, grubbers, and double row cultivators. The very latest machine introduced is the Gyrotiller, which, for all practical purposes, takes the place of a plough, roller, and harrow in turning over and pulversing the soil in a single operation in preparing for the planting. Machines for harvesting cane have been the subject of much study for many years, and three types of machine have been constructed during the past ten years and have been put on preliminary trials. They have not yet reached practical application, though the latest—the Howard Harvester—is a possibility.

Transport is a very important factor in the complete picture of cane harvesting. Cane is a bulky commodity, and transport to the mill, or even to railway lines, by wagons and drays, was found to be definitely uneconomic. Consequently, there has developed a regular transport system under which the millowners purchased their own locomotives and laid down permanent railways, reaching out to the main sources of supply, using their own locomotives and rolling-stock. The cane is hauled from the fields to the main line on a portable line which, in some cases, is provided by the mill and, in others, by the individual grower himself. The transport of the sugar, in most cases, is carried out by Government railway to the shipping ports and thence by large or small steamers to its destination, as the case may be.

The irrigation of the canefields has become almost universal, on account of low rainfall, in the Lower Burdekin district, south of Townsville, and in the last few years much also has been done in the Bundaberg district, though mostly on the large plantations.

In sugar mill machinery, the industry has kept well abreast of the times, and, apart from the general desire for efficiency, contributing factors have been the high wages and the conditions of employment as well as the necessity, particularly in later years, for reducing working costs to meet the low average price received for sugar due to the large proportion of the output that has to be exported.

The organisation of technological research was probably initiated, and certainly very successfully developed, by the Colonial Sugar Refining Company Limited. Its milling work was closely followed by the technical men at other mills and, in field work research, the company's officers were, in the earlier years of this century, practically the only ones who were in a position to make intensive study on account of the fact that they had as a basis of observations and comparisons properties throughout all the principal cane-growing areas of Queensland, New South Wales, and Fiji. Whilst the Queensland Government assisted the industry by despatching departmental officers to New Guinea in search of new varieties of cane and by a general supervision as regards entomology and pathology, it was not until 1898 that a laboratory was erected at the Mackay State Nursery for the purpose of testing the qualities of cane under cultivation, with the idea also, at a later period, of analysing soils, manures, and mill products.

Sugar Experiment Stations.

This was the genesis of the present Bureau of Sugar Experiment Stations which was established by an Act of Parliament passed in 1900. The funds for the administration of this Act are raised by a levy on the industry of, at the present time, 1d. per ton of cane crushed at each mill, the miller and grower each paying an equal part of such levy. The Government originally subsidised this fund by a contribution equal to the amount levied on the industry but, in recent years, its contribution is limited to £7,000 per annum. The Bureau is therefore now supported by the industry to the extent of substantially more than half of its total revenue.

For many years after its establishment the work accomplished by the bureau did not appear to be giving much result or even satisfaction to the industry, chiefly because, as the then Director (the late H. T. Easterby) pointed out, great difficulty was experienced in securing sufficient trained men to concentrate on the various branches of research required in this connection. It then was realised by the Director that the sugar industry would have to train its own men and, eventually, three three-year travelling scholarships were provided, open to University graduates. In due course these graduates returned to Queensland and are now doing most valuable work both in further research and in assisting the industry in its practical and technical problems.

Notwithstanding machinery and other aids to efficient and economic production, the worker and his labour is still the most important consideration, and, in fact, it is economically a subject in itself. The sugar industry is interested particularly because it is a large employer of labour, both permanent and seasonal. However, from a national point of view, it is satisfactory to note that, as the industry has developed, the nomad workers have decreased, and many of the seasonal workers and their families are making their homes in the sugar districts.

The refining of the raw sugar is the final process before the product is placed on the market for consumers. There are two refineries in Queensland—one at Bundaberg and the other at Brisbane—the latter is owned by the Colonial Sugar Refining Company, which also has refineries in Sydney, Melbourne, Adelaide, and Fremantle.

Population Figures.

Evidence of what the sugar industry has done towards the settlement of North Queensland is afforded by official figures. In 1901 the total population of Douglas Shire, Cairns town, Cairns Shire, Johnstone Shire, Cardwell Shire, and Hinchinbrook Shire, was 14,665. In 1911, it had only increased to 17,191. In 1921, in the same area, the population was 25,954, and at the 1933 census in the same area the population was 52,659. This was an increase of over 100 per cent. in twelve years. The sugar districts south of Townsville have also increased, though not to the same extent. In the same period—that is, between 1921 and 1933—the population of Queensland increased by 25 per cent., and that of the whole Commonwealth by 21·94 per cent., so it is clear that the sugar industry is making no small contribution to the factors of development and employment.

◆

THE SOIL.

The soil not only gives us the harvest in due season, but it is the breeder of human character. It is natural to live in the open, to feel the warmth of the sun on the face and the sharp sting of the wind-blown rain.

If for nothing else than the part agriculture plays in the spiritual life of our race, it should be lifted up from discouragements which now beset it like a plague. —"The Farmer and Stock-Breeder" (England).

Marketing Strawberries.

JAS. H. GREGORY, Instructor in Fruit Packing.

QUEENSLAND has become known throughout Australia for its ability to supply high quality strawberries to the Southern States during their out-of-season period. Our single layer carton in which all fruit is open to inspection is now quite a common sight in Melbourne and Sydney.

The regularity of aeroplane transport has opened up new avenues of distribution, many western towns now being able to receive regular consignments of berries. As the strawberry possibly is the most tender fruit we have to handle, special methods of packing are necessary to enable it to be transported long distances successfully. Close attention, therefore, must be paid to all equipment used for marketing this delicious fruit.

CONTAINERS.

Many types of containers are used for marketing strawberries. In some of the Southern States a punnet is in general use, but as this has the disadvantage of containing more than one layer of berries with each layer resting upon the other, it is not as suitable as the single layer packed box in general use in Queensland. There are two types of boxes in use—one which measures 8 inches long by 4 inches wide by 1¼ inches deep—obtainable in either plywood or cardboard—and the other made of wood, 24 inches long by 8 inches wide by 1½ inches deep measured clear of its central partition. The smaller of the two containers is preferable, because it allows less latitude for mistakes and for spoiling the appearance and alignment of the fruit when packing. Being smaller, the fruit is less likely to become loose in the box through careless handling, and so being damaged through rubbing and otherwise. It is also a better container for retailing. The larger box or tray, which contains the equivalent of six smaller boxes, may hold too much fruit for the average buyer when prices are high

The Mechanical Thoroughbred!

DIAMOND—T TRUCK

For thirty years the Diamond-T factory has specialised in the manufacture of transport vehicles. Every constructional detail is oversize and over strength. In every casting, forging, and mechanical part the highest quality of material and thirty years' experience of the world's finest engineers are combined, resulting in the production of what are unquestionably the WORLD'S FINEST TRUCKS. Models 2, 2½, and 3 tons with varying wheel bases and both standard and dual range rear axles.

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This Cloth is softer than a counter-lining, and will last much longer.

Write for Latest Catalogue. Post Free.

G. J. SCHNEIDER
87 GEORGE STREET, BRISBANE.

FOR MEN

Many men have the impression that a Savings Bank Account is suitable only for women and children, and that it is neither convenient nor dignified enough for business men. Certainly those business men who have many payments to make over a considerable area need cheque accounts, but even those, in common with all other men, will find the Savings Account a most useful and convenient aid to money accumulation. There is nothing undignified in the transaction of Savings Bank business, but there is interest profit to be earned on such monies as would otherwise lie idle.

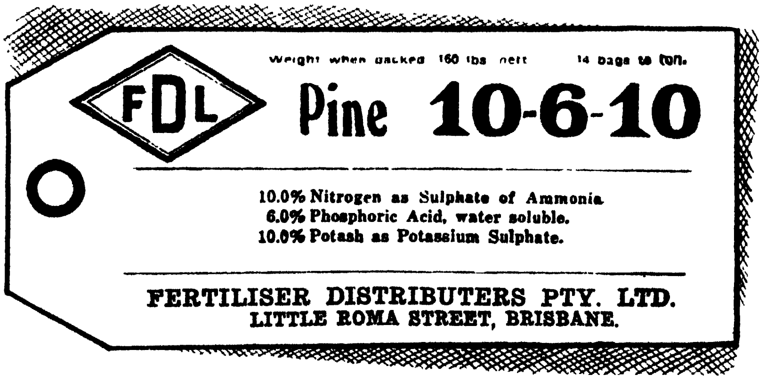
Throughout Australia there are Branches and Post Office Agencies of the

Commonwealth Savings Bank of Australia

(Guaranteed by the Commonwealth Government.)

Walsh's
Selected
Farm
Seeds

Growers kindly note—
We sell you Machine
Cleaned, Graded, Tested,
and *True to Name Seeds*
Our Advice—
PLANT THE BEST
Write us or 'Phone 175
Walsh & Co. Pty Ltd
SEED SPECIALISTS
Bell St. - - Toowoomba



Weight when packed 160 lbs nett 14 bags to ton.
FDL
Pine 10-6-10
10.0% Nitrogen as Sulphate of Ammonia.
6.0% Phosphoric Acid, water soluble.
10.0% Potash as Potassium Sulphate.
FERTILISER DISTRIBUTERS PTY. LTD.
LITTLE ROMA STREET, BRISBANE.

DRY—FREE-RUNNING
MATURED IN BULK
AND DOUBLE-MILLED
New Season's Supplies now Available
Insist on F.D.L. - 10-6-10
Obtainable from
Day & Grimes, Nambour; A. Ward, Palmwoods; and Fruitgrowers Co-op. Association at Woombye, Beerburrum, Glasshouse Mountains, and Wamuran.
FERTILISER DISTRIBUTERS Pty. Ltd.
LITTLE ROMA STREET, BRISBANE.

Plate 119.
Using the Picking Tray.

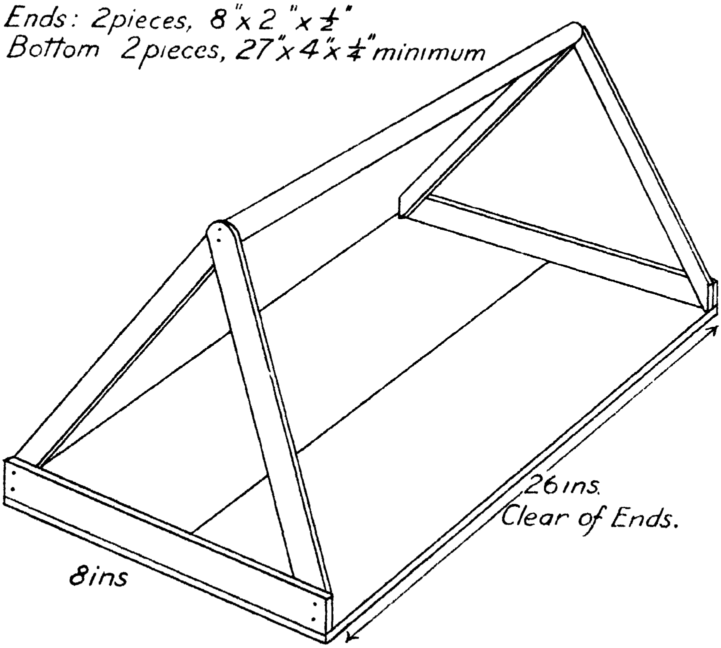

Ends: 2pieces, 8"x 2"x ½"
Bottom 2pieces, 27"x 4"x ¼" minimum
26 ins.
Clear of Ends.
8 ins

Plate 120.
Picking Tray Holder.

necessitating repacking into smaller boxes. As the strawberry is such a soft fruit, it is desirable that it should be handled as little as possible. The smaller container also has the advantage of allowing for better sizing and packing when the supplies of berries are short. Twenty of the boxes 8 inches by 4 inches by 1¼ inches will just fit comfortably into a half-dump case.

FRUIT PROTECTION.

Fruit should be cooled always before packing and when carried for long distances it must be kept at a cool, even temperature. Fruit should never be placed in the sun, or in places where it will become heated. Exposure to rain, dust, and wind must also be avoided.

PICKING.

Much time and handling can be saved by using a picking container. A good type of picking tray is illustrated (plate 122). An examination of the illustration will show that in addition to having a handle, the tray is fitted with two compartments. Another type is shown whereby an ordinary tray can be used (plate 119). When picking, the first grade berries fit for marketing are placed at one end of the tray, and second class or factory berries at the other. Where growers are picking for Southern markets, this method may be varied. The solid, full, three-quarter coloured berries for distant markets are placed on one end, while the full-coloured ripe berries, fit to send to the local market, are placed on one side of the other end. Jam fruit is placed on the other side of the same end as the local market fruit, being kept separate. The adoption of this system means a great saving in time and handling, as the berries are graded automatically for each market. It should be remembered that in the case of strawberries a saving of even one handling means a lot in increased range of travel and carrying capacity. Berries should not be picked or packed while wet, and all skin-damaged fruit should be rejected rigorously. Fruit that has come in contact with damaged berries also should be relegated to the "jam" quality. Care when picking will minimise the risk of damage to berries. Fruit should be handled as much as possible by the stalk only. It should not be pulled about or turned over in heaps while being handled, because the slightest damage to the skin means an opening for the entrance of rots.

The best method of picking is by using the thumb and fore-finger, the berries being pinched actually from the plant. A stem three-eighths to one half-inch in length should be left on each berry. Berries should not be thrown or dropped into the picking trays or boxes during handling. If the stalk is pulled out from the fruit in any way, the berry should be relegated immediately to the factory grade, as the skin around the stalk would be broken slightly.

HANDLING.

When using the small box or punnet, 8 inches by 4 inches by 1¼ inches, berries are packed for market in three packs—threes, fours, and fives across the box. In the tray 24 inches by 8 inches by 1½ inches the fruit will pack five, six, seven, eight, nine, and ten across. It is only during periods of short supply and high prices that it is recommended to pack tens. Nines and tens are sometimes packed together. Much time and labour is necessary to pack fruit so small

Plate 121.
A North Coast Strawberry Garden.

and even after packing it still looks a very second-grade article. Sizing is done while packing, the packer having a box for each size. Women and girls usually make the best berry packers, having, as a general rule, a lightness of touch which is often lacking in the case of men operatives. Berries with grains of earth adhering to them, as is the case often after rain, should be gently brushed. This is best done by placing a soft lacquer brush as a fixture, standing upright in the bench, and by taking the berry by the stalk and gently running it through the bristles of the brush. Brushing the fruit in this manner is quicker and more efficient than endeavouring to use the brush in the normal way.

PACKING.

The method of packing is simple enough. The box is first prepared by placing a prepared leaf across the end of the box (plate 123), (passion fruit leaves are very suitable, and, when these are not available, fern leaves sometimes are used); the leaf should project high enough to reach the top of the box, and at the same time be bent enough to place thereon the first line of berries—threes, fours, or fives, according to size. The berries should be placed on their stalk ends with the points up, allowing the point of the fruit to reach to the level of the top of the box. (See plate 124.) Another prepared leaf is then placed in the box, bent so as to rest on the bottom of the box to have the next line of berries placed thereon, while the remainder of the leaf rests against the first line of berries and acts as a separator of the lines of fruit. (See plate 125.) This process is repeated until the box is filled. For travelling, a layer of leaves or fern is placed on top of the finished pack to assist against damage (plate 131).

A study of the different packs in the boxes shows a variation in the count which can be placed in each box. The shape of the berries causes this variation:—

"Threes," 15, 18, and 21 to the box.
"Fours," 28 and 32 to the box.
"Fives," 40, 45, and 50 to the box.

The trays are packed on the same principle as the boxes, the greater width giving the extra number of berries across the end of the case.

For the best results the points to be watched are:—

See that the fruit is placed so that the tips will come as near as possible to the level of the top of the box without touching, and it will then keep snug when the lid is placed in position.

Avoid packing too high.

Keep the alignment of the fruit straight both across the box and from one end to the other. (See illustrations of packed boxes.)

Avoid placing too large pieces of packing leaves between the berries.

See that the berries do not rattle in the box after the lid is placed in position.

Keep all badly-coloured berries out of the box, as they spoil the commercial appearance of the package when displayed for sale.

On no account pack damaged berries, even those only slightly damaged will spoil the keeping qualities of the box. One bad berry will soon make a whole boxful practically unsaleable.

Keep the fruit dry and free from juice.

Grade to an even colour for each box.

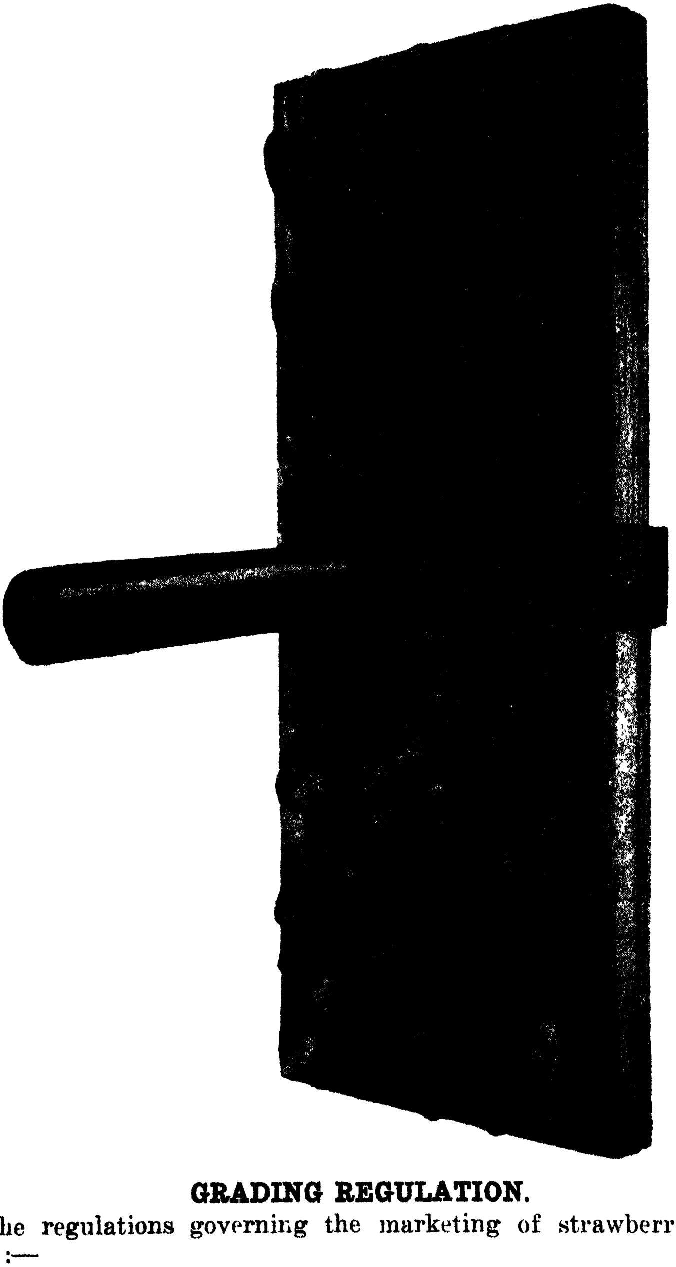


Plate 122.

PACKING TRAY FILLED WITH FRUIT.—Note the difference in colour of the grades of fruit in either end of the tray.

GRADING REGULATION.

The regulations governing the marketing of strawberries are as follow:—

> "When strawberries are marketed in punnets, such punnets shall be marked legibly and durably on the top side and also

on the end of the bottom half of the punnet in which the fruit is packed with the name and address of the packer in block letters of not less than three-sixteenths of an inch in height. The following penalties are prescribed for any contravention of this regulation:—

(*a*) For a first offence not exceeding two pounds.

(*b*) For a second or subsequent offence not less than two pounds nor more than twenty pounds."

All the necessary stamping of boxes can be quickly and easily done with rubber stamps. A set of rubber stamps covering all the requisite particulars can be obtained for a few shillings at any stamp makers. It is well worth while also to stamp the grade of fruit on the lid of the punnet.

DESPATCHING.

When packed, the small boxes, if being sent long distances, are packed in Australian dump half-bushel cases 18 inches by 8⅝ inches by 7½ inches, the case holding twenty boxes. If not all the one count, the details of the number of each count in the case should be placed on the end. This saves extra handling on the market section. For short transit to local markets the boxes are placed in bundles and tied together in their different sizes. Where a sufficient quantity of boxes is available it always is recommended that the boxes be packed in cases to send to any market. This allows the country order buyer to obtain fruit, knowing there is no necessity to pack it, and so creating a wider demand for consignments.

STENCILLING.

When stencilling, care should be taken to see that stencils are applied neatly, with no smeared edges. Using the stencil ink in conjunction with a handful of engineers' cotton waste to form a pad to absorb excess moisture is economical, and makes neat, clean stencilling easy.

When carting to the rail or market do not use the packed boxes as a seat.

PACKING-HOUSE HYGIENE.

Packing-house hygiene is most important if the risk of disease is to be reduced. Most transit troubles are caused through fungal infections. If fruit is allowed to lie about the packing shed and decay, the risk of infecting good fruit is greatly increased. The difficulty lies in the fact that infection is not noticed at the time of packing, but the development takes place during transit, to the detriment of satisfactory prices. All packing sheds should be thoroughly cleaned up after using, and occasionally sprayed out with a solution of formalin and water—one part formalin to twenty parts of water. All implements should be carefully cleaned and put away until again needed.

As the whole basis of successful marketing is care, growers should follow this principle right to the finish of their share of handling. Good packing, stencilling, &c., will not continue to sell bad fruit, and it is only by care in producing, handling, and marketing good fruit that one is able to meet competition and obtain satisfactory financial results. It must be remembered that the rule, "the consumer is right," prevails as much in the fruit as in other industries.

HOW TO START TO PACK THE BOX.

8 inches long, x 4 inches wide, x $1\frac{1}{4}$ inches deep.

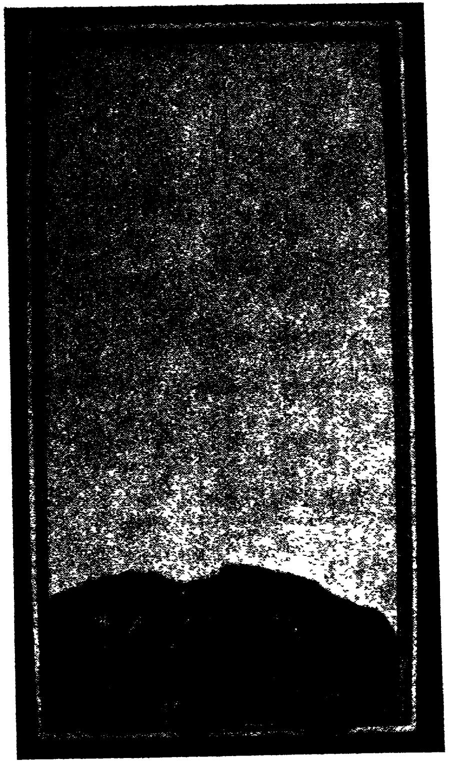
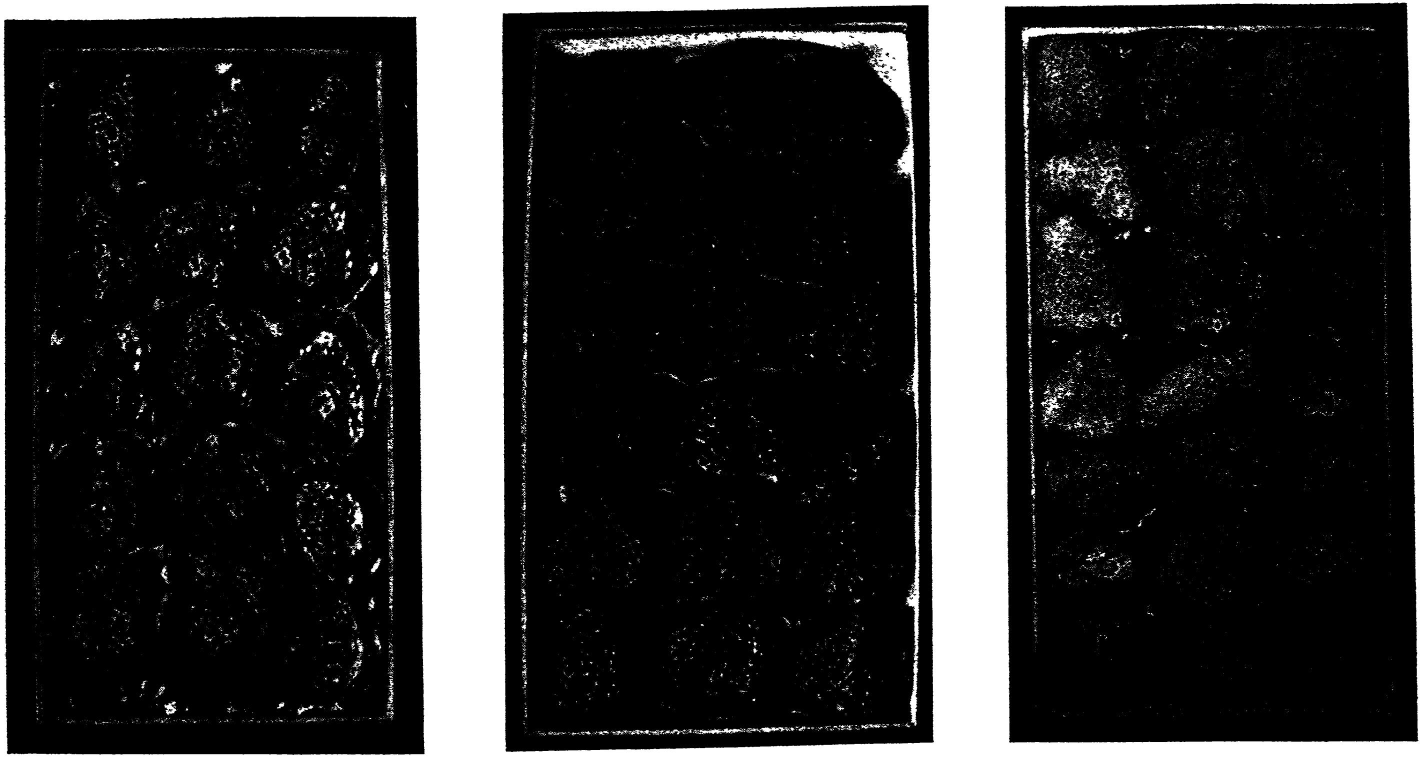


Plate 123.
Leaf in position ready for the placing of the layer of fruit.

Plate 124.
First line of fruit in position.

Plate 125.
Starting the second line of fruit.

HOW TO PACK "THREES" IN BOXES



15 Count.

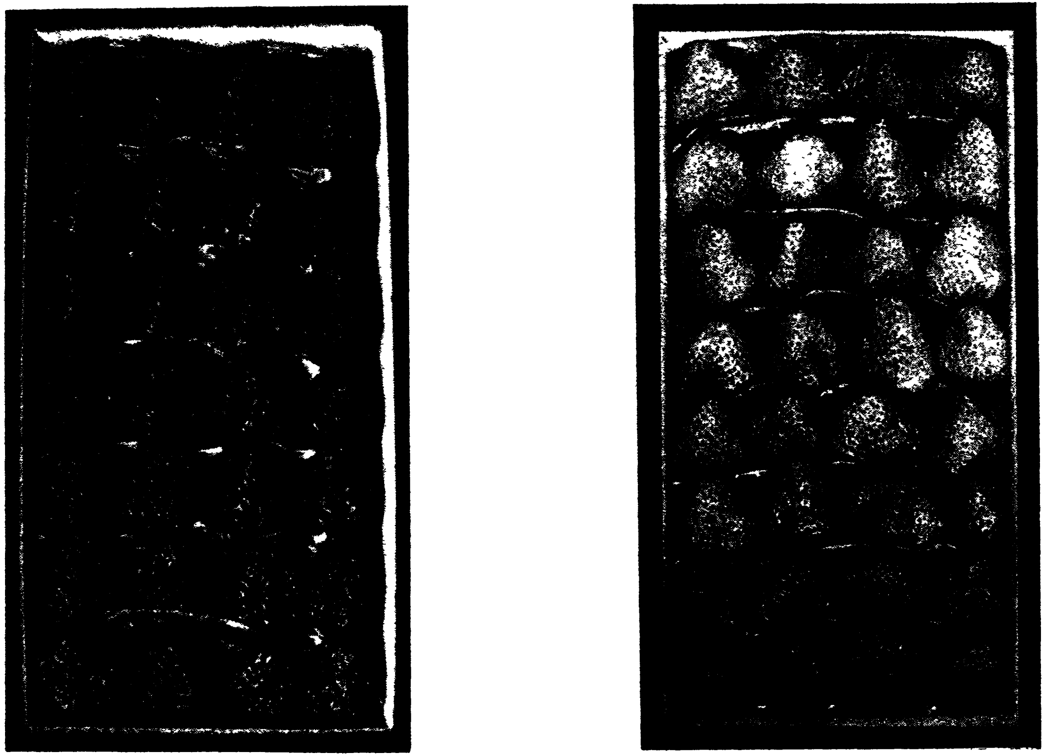
18 Count.

21 Count.

Plate 126.

Finished Boxes.

HOW TO PACK "FOURS" IN BOXES.

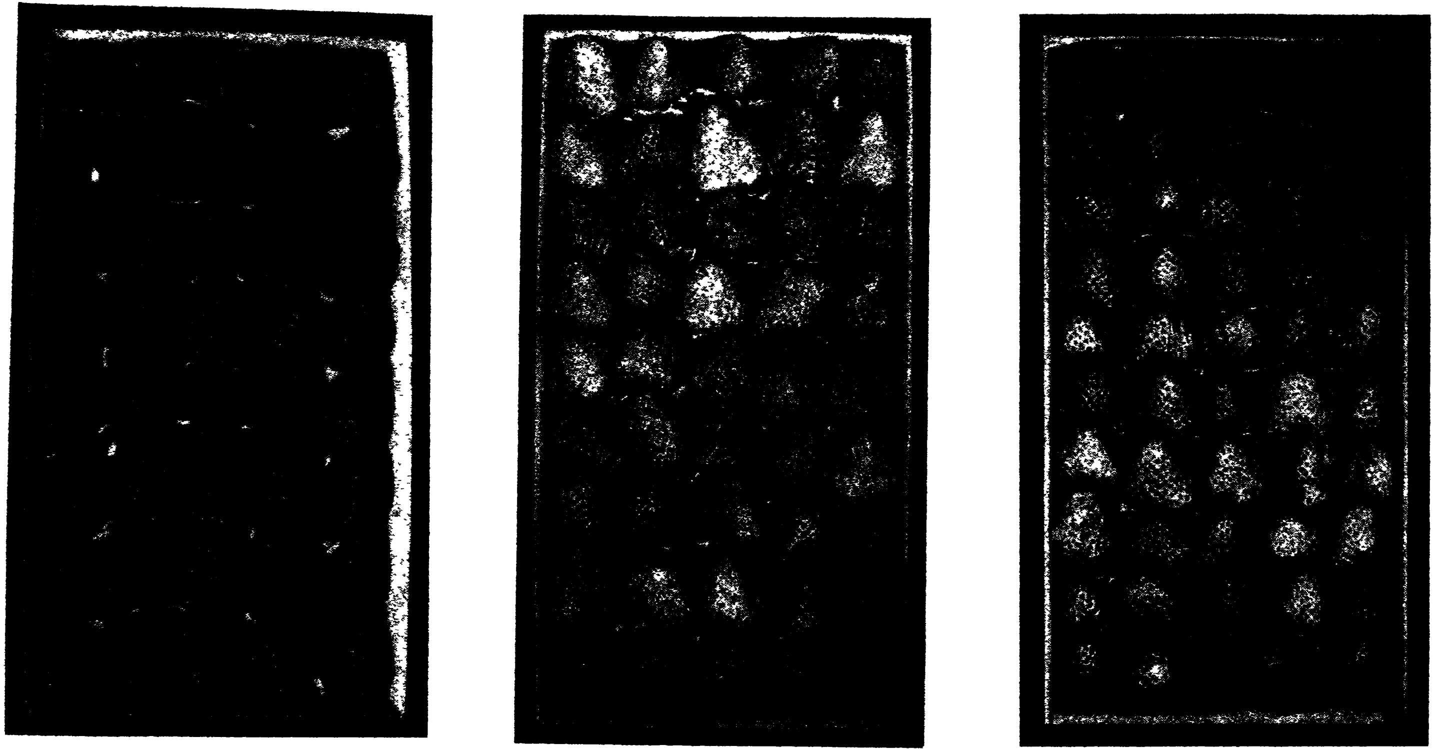


28 Count.

32 Count.

Plate 127.
Finished Boxes.

HOW TO PACK "FIVES" IN BOXES.

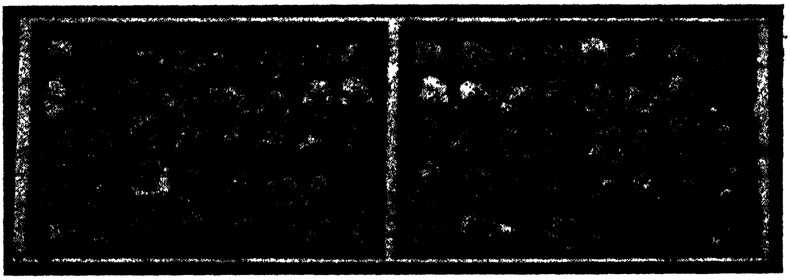


40 Count. 45 Count. 50 Count.

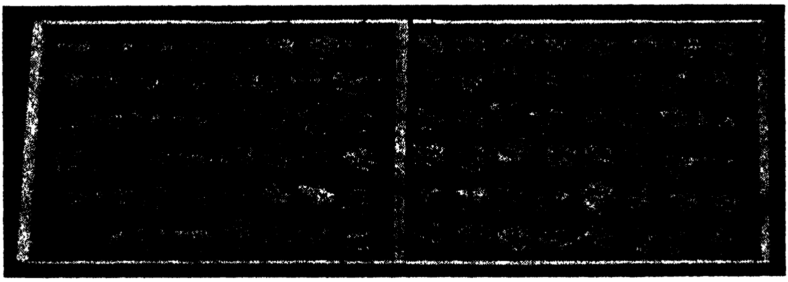
Plate 128.
Finished Boxes.

HOW TO PACK TRAYS.

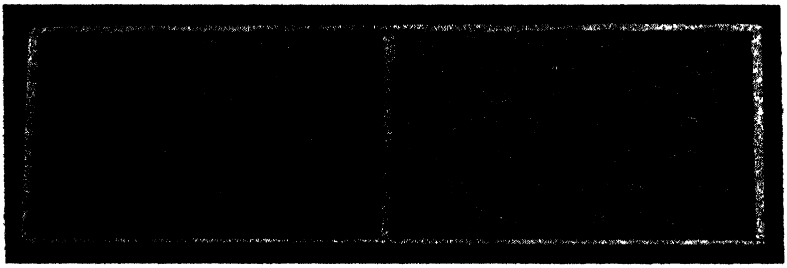
24 inches long, x 8 inches wide, x 1½ inches deep.



Fives.



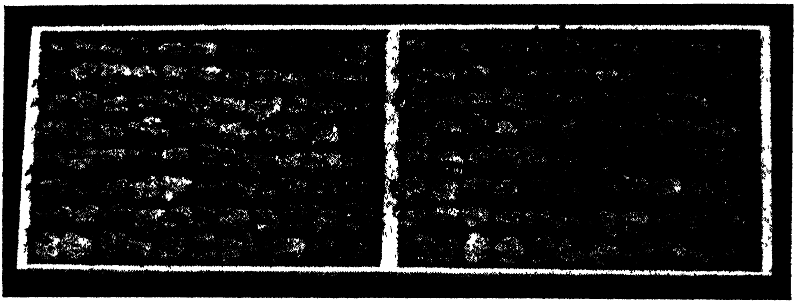
Sixes.



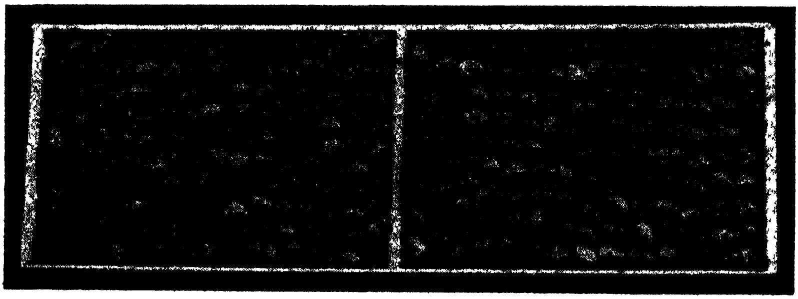
Sevens.

Plate 129.
Trays Packed for Market.

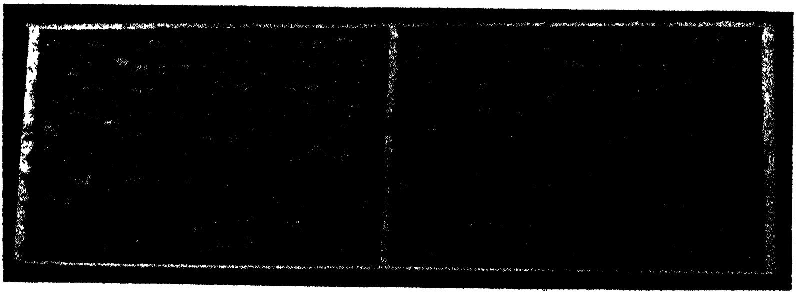
PACKING THE TRAY.



Eights.



Nines.



Tens.

Plate 130.
Trays Packed for Market.

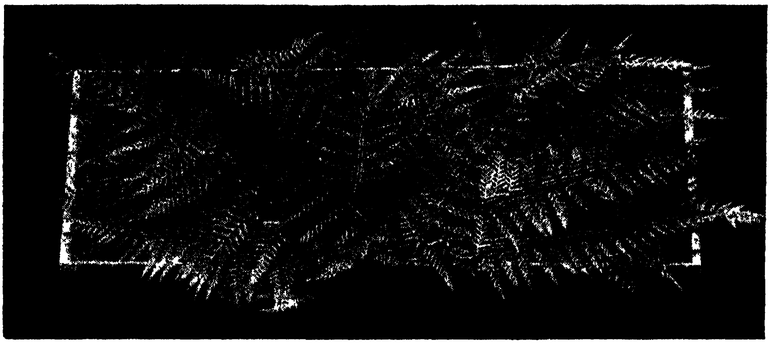


Plate 131.

Finished tray showing the placing of fern on the top of the fruit before placing lid in position. All protruding ends of fern are cut carefully after the lid is placed in position.

FACTORY GRADE FRUIT FOR SUPPLYING TO THE PUBLIC.

The use of a small box is recommended for this class of trade. A box holding 4 lb. to 6 lb. of fruit is desirable. Only sound berries should be packed. The fruit should not be stalked as it may be necessary for the retailer to hold the fruit during a quiet sales period. Each box should be lined with grease-proof paper before the fruit is placed therein. The net weight of fruit should be stamped on the end of the box. For supplies direct to the factory, containers may be obtained from the Committee of Direction of Fruit Marketing, Turbot street, Brisbane, with full instructions as to the quality of fruit required. As factory quality varies from year to year it would serve no useful purpose to describe present standards in this booklet.

Plate 132.

A Ripening Harvest.

ACKNOWLEDGMENT.

Thanks are due to Mr. Coxhell, of Chevallum, for permitting the use of his fruit, and also the Eudlo District show exhibitors at Nambour who supplied the box of fifteen pack.

Some Tropical Fruits.

No. 17. THE SAPODILLA.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE Order Sapotaceæ contains a number of species, producing edible fruits; but the best known, and most highly esteemed, is the Sapodilla (*Achras sapota*, L.).

This fruit is a native of tropical America, in some parts of which it is reported to be growing abundantly in a wild state. From that region it has spread throughout most tropical countries. However, in spite of being regarded as one of the best indigenous tropical fruits of America, its cultivation has not been undertaken extensively in many other countries. Possibly the difficulty of propagation, and the very slow rate of growth, have been limiting factors in its commercial cultivation.

Macmillan states that the Sapodilla was introduced to Ceylon about 1802, but is met with yet only occasionally. In Queensland the writer knows of only one large tree and several small ones. One large tree also is growing in the Botanic Gardens at Rabaul, New Guinea. The Queensland specimen, although nearly twenty years old, has not fruited yet, but the New Guinea tree was bearing regularly for some years, although it has failed during the last year or two. The Queensland tree produced a crop of blooms early this year but shed them all. Possibly next year it may set some fruits.

The Sapodilla, as already mentioned, is slow growing, and trees raised from seed usually require about two years in the seed-bed and nursery before they are large enough to set out in the field.

The tree is of upright habit and forms a compact, shapely head. The dark green, glossy, and rather leathery leaves, of three to four inches in length clustered at the ends of the branchlets, give the tree an attractive appearance.

Authorities differ as to the dimensions attained by the tree. Whilst one quotes it as a small tree of 20 to 30 feet, another speaks of it as attaining to 50 to 75 feet. The Queensland specimen of fifteen to twenty years old is only about 15 feet high.

The flowers are small and white, and are produced in the leaf axils near the ends of the branchlets. In Queensland the flowering season was observed to be January-February. Whether a second crop will be produced here in the year, as is the case in several other countries, is yet to be proved. It is reasonable, however, to expect that trees in North Queensland will carry two crops annually, as climatic and soil conditions are not vastly different to other tropical countries.

The fruit are reported to vary in size and shape on different trees; but are commonly from round ~~to ovoid~~, up to about 3½ inches in diameter. The thin, russet-brown skin contains, when ripe, a yellowish brown, translucent, sweet flesh in which the shining black seeds are embedded. The fruit is a dessert one and seldom is prepared in any way. When thoroughly ripe it is said to be of delicious flavour; but, if not properly mature, it contains a milky latex which renders it unpalatable.

The plant is raised usually from seed which takes about five weeks to germinate. Vegetative methods of propagation have been tried in various countries, but do not appear to be too reliable. Budding has been tried in America, and grafting, inarching, and layering in India, whilst in New Guinea marcottage is applied, and in Trinidad cuttings have been struck in special striking chambers. However, in spite of the multiplicity of methods used most authorities agree that vegetative propagation is difficult.

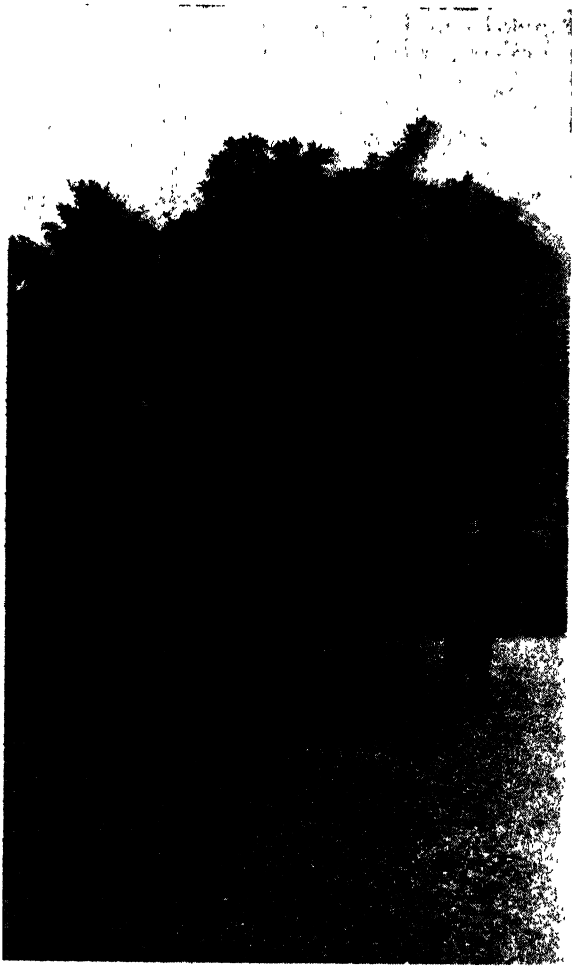


Plate 133.

Sapodilla Tree—A Queensland Specimen.

In Mexico and Central America the Sapodilla is gr la the production of a gum called Chicle Gum, which des from the trunk of the tree when incisions are made in the b k. Chicle gum forms the basis of chewing gum, the confection so p ular in America. The production of the gum is quite an important i stry in the countries mentioned, and Macmillan reports that the annual export from Mexico amounts to over 2,000 tons.

In addition to the term Sapodilla, this fruit is known also as Chico and Naseberry, whilst botanical synonyms of *Achr as sapota* are *Sapota achras* (Mill) and *Sapota zapotilla* (Coville).

Cabbage-growing for Market.

C. N. MORGAN, Inspector, Diseases in Plants.

THE cabbage is one of the most important vegetables for the market gardener. It grows best in the cooler districts, but by selecting varieties carefully the crop may be grown in most parts of Queensland.

The seed should be sown in beds of well-drained, deeply and thoroughly worked soil. The soil, if heavy, should be improved by the addition of sand or decayed vegetable manure, and if poor and sandy the addition of a loamy soil or well-rotted manure will be beneficial.

The surface of the bed should be fertilized and firmed, and the seed sown thinly in shallow drills about 4 inches apart. After sowing, the bed should be mulched with well-rotted leaf mould to prevent excessive evaporation of moisture.

The seed-bed must be watered regularly, for a check in the growth of young seedlings is followed frequently by unsatisfactory results.

When large enough to handle, the seedlings should be thinned to an inch apart, for if grown too thickly they develop into long, spindly, weak plants.

Shading during the hottest part of the day is necessary in many cases; but this shade should be removed as soon as the plants are strong enough to withstand the heat. Overshading also produces spindly plants. Approximately 1 lb. of seed will provide sufficient plants for an acre of cabbage.

In about six weeks the young plants should be large enough for transplanting, and then can be hardened off by restricting water supplies for a day or two before their removal to the field. Transplanting should be done in cloudy or showery weather, but if conditions are not quite favourable the young seedlings should be watered in, and, as a further precaution, the top half of the leaves may be trimmed off to lessen transpiration until the root system is established.

The loosening of the soil in the seed-bed with a fork before lifting the plants helps to save many of the small roots. If the bed has been well soaked previously, the plants will lift with a ball of soil adhering to the roots, and this will help to keep them moist.

The roots of the young plants should be kept damp after removal from the bed by standing them in a bucket containing a puddle of soil and water.

In planting, a hole is first made in the ground with a dibble—an old spade or digging fork handle is suitable. The hole should be only deep enough to allow the roots of the seedling to reach the bottom of the hole. A little earth should be turned in and the plant drawn slightly upwards before pressing the soil firmly around it. This ensures that the main root will not be doubled up.

The plants should be in rows 3 feet apart. In the rows the smaller varieties should be spaced 2½ feet and the larger varieties 3 feet apart. The growth of cabbages should not be checked on any account, and for that reason regular cultivation and watering are essential.

Correct varieties should be selected for different times of the year. Winter-planting types should be early and quick maturing.

In the cooler areas, seed of the early varieties is sown during the months of February, March, and April. Main crop varieties are sown between August and December. The coastal districts are suited best to the winter crop, and seed for the main crop is planted generally during December and January.

Cabbage should be marketed as soon as possible after cutting, and only those having good firm hearts placed on the market. Care in handling is essential, and when packed in bags for railing they should be packed as firmly as possible.

Recommended varieties are as follows:—

Early.—Early Allhead and Early Drumhead, both of which are large, early, and quick growers.

Main Crop.—Succession is the most popular variety, and may be grown almost at any time. It is a good large Drumhead type.

Surehead is slightly larger than Succession. It is hardy, and may be planted closer in the rows, as it has fewer outside leaves.

A USEFUL IMPLEMENT.

A useful implement for levelling cultivated land, breaking sods and spreading cow manure, can be made from two old cart tyres, joined with ringed bolts and with hooked bolts for attachments. Any handy man can make these, and with the chain harrows attached they will do splendid work.

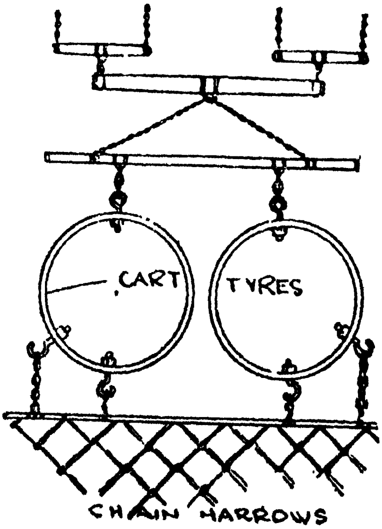


Plate 134.

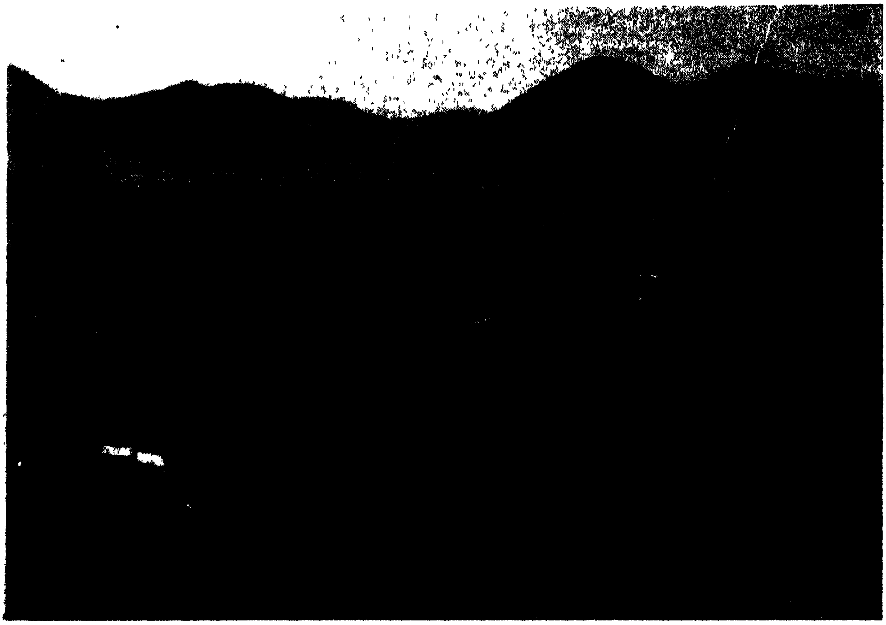


Plate 135.
Banana Country, South Coast District, Queensland.

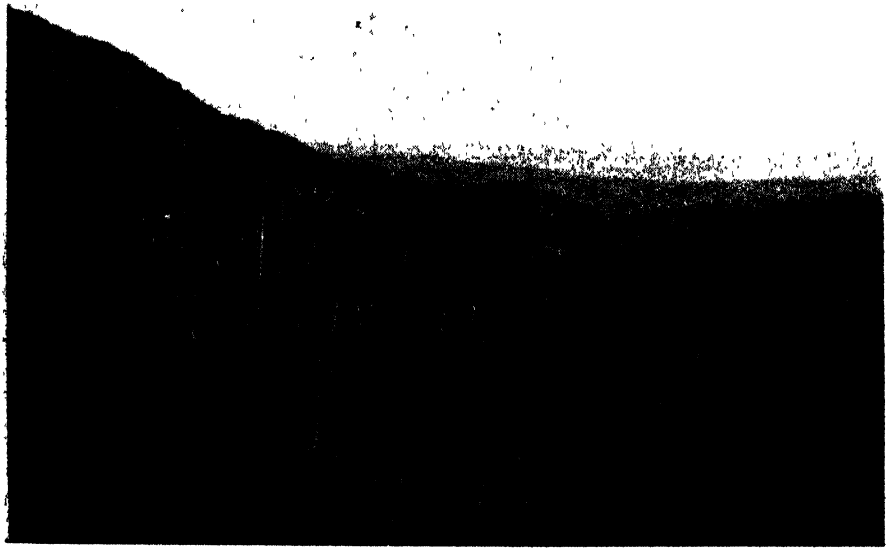


Plate 136.
A North Coast Banana Plantation, Queensland.

Establishing the Avocado Orchard.

The increasing popularity of the avocado has brought this nutritious fruit recently to the notice of the commercial orchardist, and intending planters are at present considering the preparation of land for establishing orchards.

The avocado seems to be adapted to a variety of soils, the chief requisite being perfect drainage—stagnant water at the roots is fatal. The heavier soils seem to be more favourable to the growth of the tree than light sandy loams, but where possible moist medium loams should be selected for the crop.

The climatic conditions of the coastal foothill districts of Southern Queensland are generally considered satisfactory for avocado culture. Up to the present, it has not been the general custom to irrigate avocado trees. However, a wet spring is usually followed by a good crop and a dry spring by a poor crop. During the present season, only those orchards in which watering was practised have yielded good crops. The question of supplying water to the trees during dry springs therefore should receive consideration.

Avocado trees will only thrive in frost-free, well-sheltered, warm situations. In districts where the prevailing winds are such as to interfere with the normal growth, belts of standing scrub should be retained as a protection to the orchard. As an alternative, artificial windbreaks may be required. The site should be an area of unbroken land, nearly level or with a gentle slope. Steep hillsides should be avoided on account of the danger of sustaining irreparable losses by soil erosion.

The preparation of the land should be thorough. All stumps and roots should be removed to a depth sufficient to ensure that they do not impede cultivation. The land should be skim ploughed and then cross ploughed and harrowed. In that way rubbish and roots can be collected and burnt. When the weeds are eliminated, the land should be cultivated as deeply as possible, and the soil worked down to a fine tilth. Where practicable sub-soiling is desirable, as it facilitates root development.

In Queensland, it is usual to plant on the square system, though on hillsides a form of contour planting is preferable. The trees are spaced 25 feet apart, which permits of seventy being planted to the acre. The young trees should be planted so that the point of union between the bud and the seedling stock is slightly above the soil level.

A liberal watering is necessary after planting. The ground around the young trees should be kept liberally mulched with any coarse material which is not liable to pack and form a layer impervious to air and water. Spring planting is customary, though trees planted towards the end of the wet season (February to March) after the hottest period of the year have done equally well.

Numerous varieties have been introduced into Queensland, but many have been discarded for various reasons. Trial plots recently have been planted and those varieties which promise to be suitable are being worked up and kept under observation. Although at present no definite recommendations can be made, intending planters should confine their selection to varieties such as Blakeman, Grande, Goodwood, Queen, Spinke, and Wilsonia, which from the date at present available appear suitable for coastal foothill plantings for Southern Queensland.

R. L. Prest.

◆

VEGETABLE CROP ROTATION.

The necessity for the rotation of crops in any particular plot of land must be plain to every observant ,market gardener. Not only does crop production fall off when the same crop is planted several times in succession, but pests and diseases frequently become worse in each succeeding crop.

In working out any system of rotation the following general rules may be taken as a guide:—

Plants belonging to the same natural order should not succeed one another. For example, tomatoes, potatoes, and the egg plant belong to the same order, and therefore should not be grown after one another in the same land.

Plants grown for their roots or tubers should not be succeeded by others grown for the same purpose, as, for example, carrots, turnips, and beet.

Crops occupying the soil for a long period should be followed by quick-maturing crops.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

BRISBANE marketing arrangements during the month were unsettled somewhat by the holding of the Royal National Society's exhibition. During this period many lines of fruit always have an easement in demand, with a consequent drop in prices. Growers should bear this in mind, and just send along regular consignments, only increasing supplies when requested to do so by agents.

Showery weather has been experienced in most of the coastal districts, spoiling to some extent the keeping quality of softer fruits, such as strawberries.

Melbourne and Sydney markets have maintained values for most fruits, but green papaws and pines have been unpopular and are extremely hard of sale. It is difficult to understand why growers continue to add handicaps to the development of tropical fruit markets in the South. Queensland practically has a monopoly of tropical fruits which, if developed on the right lines, will be a great acquisition to the State Too often we see custard apples, papaws, pineapples, and other fruits displayed for sale in Melbourne and Sydney shops in such a condition that no Queenslander would consider them as fit for human consumption. It must be remembered that from May to September the weather in Melbourne, judged on Queensland standards, is cold, and that none of the tropical fruits will ripen naturally during such weather. It is necessary therefore to have the fruit fully matured and nearly ripe before it leaves this State.

Prices on the various markets are as follows:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Nines, to 22s. 6d. per tropical case; eights, 19s. 6d. to 22s. per tropical case; sevens, 18s. to 20s. per tropical case; sixes, 15s. to 19s. 6d. per tropical case; small, 12s. to 17s. per tropical case; bunch fruit, 3d. to 9d. per dozen.

Lady's Fingers, 2d. to 7½d. per dozen.

Sydney.—Cavendish: Nines and eights, 22s. to 26s. per tropical case; sevens, 20s. to 24s. per tropical case; sixes, 17s. to 22s. per tropical case. Inferior grades lower in price.

Lady's Fingers (in clusters), to 22s. per case.

Melbourne.—Cavendish: Nines and eights, 23s. to 24s. per tropical case; sevens, 21s. to 22s. per tropical case; sixes, 19s. to 20s. per tropical case.

Pineapples.

Brisbane.—Smooths, 4s. 6d. to 7s. per case; 1s. 6d. to 6s. per dozen. Ripleys, 4s. to 6s. per case; 1s. to 4s. per dozen.

Sydney.—Smooths, 8s. to 11s. per case.

Melbourne.—Smooths, 8s. to 11s. per case.

Papaws.

Brisbane.—Yarwun, 6s. to 10s. per tropical case; Gunalda, 5s. to 6s. per bushel case; Locals, 2s. 6d. to 5s. per bushel case.

Sydney.—12s. to 16s. per tropical case. Green fruit unsaleable and not wanted.

Melbourne.—14s. to 16s. per tropical case. Green fruit unsaleable.

Custard Apples.

Brisbane.—4s. 6d. to 6s. per half-bushel. Supplies of this fruit are now falling off, and prices should remain firm.

CITRUS FRUITS.

Oranges.

Brisbane.—Commons, 5s. to 8s. per bushel; navels (mostly New South Wales), 8s. to 10s. per bushel.

With increased supplies from New South Wales the market for oranges has shown a tendency to ease.

Mandarins.

Brisbane.—Glens, 6s. to 13s. per bushel; Gayndah Glens, 12s. to 14s. per bushel; Emperors, 6s. to 12s. per bushel; Scarlets, 6s. to 12s. per bushel.

Many poor lines of Glens have been marketed, the fruit being past its prime and showing a tendency to dryness. Some small lines of Ellendales have been sent from Gayndah; the fruit was of excellent quality and realised up to 18s. per case.

Sydney.—3s. to 7s. per bushel.

Melbourne.—5s. to 12s. per bushel.

Grape Fruit.

Brisbane.—6s. to 9s. per bushel; specials higher.

Sydney—4s. to 10s. per bushel.

Melbourne.—4s. to 10s. per bushel.

Lemons.

Brisbane.—Gayndah, 11s. to 14s. per bushel; Benyenda, 13s. to 15s. per bushel; locals, 5s. to 9s. per bushel; southern, 5s. to 9s. per bushel.

Sydney.—2s. to 5s. per bushel.

Melbourne.—4s. to 9s. per bushel.

OTHER FRUITS.

Passion Fruit.

A strong demand exists for lines of first-class fruit. Many growers still make the mistake of packing together smooth and crinkled fruit.

Brisbane.—First grade, 8s. to 10s. per half-bushel; seconds, 5s. to 7s. per half-bushel; specials higher.

Sydney.—4s. to 10s. per half-bushel

Melbourne.—2s. to 6s. per half-bushel; a few specials higher.

Strawberries.

Brisbane.—4s. 6d. to 9s. per dozen boxes.

Sydney.—3s. to 5s. per tray; 7s. to 11s. per dozen boxes.

Berries are not keeping as well as usual, and growers are strongly advised to exercise every care when packing to eliminate any damaged fruit.

Cape Gooseberries.

Brisbane.—6d. to 7d. per lb.

Many lines show a high percentage of green fruit mixed with the coloured. This can be avoided, and the value of the fruit will be raised accordingly.

Tomatoes.

Brisbane.—A sharp rise in the price of tomatoes occurred at the beginning of the month, up to 7s. per case being paid. Prices eased slightly after this, but remained firm at from 4s. to 6s. for really good fruit. Before going to press a further rise had taken place. Prices were:—Green fruit, 2s. 6d. to 6s. per half-bushel; ripe fruit, 2s. 6d. to 6s. per half-bushel; coloured, 3s. to 8s. per half-bushel.

Sydney.—Queensland fruit 4s. to 7s. per half-bushel. Western Australian fruit is expected shortly; so there is a possibility of prices easing slightly, although good fruit will maintain its value.

Melbourne.—Adelaide hothouse, 7s. to 10s.; Western Australian, 4s. to 8s. Large consignments of Western Australian fruit are expected.

Apples.

Brisbane.—Southern fruit: Jonathan, 6s. to 9s. per case; much inferior fruit is on the market, and is hard of sale at from 3s. to 5s. per case; Granny Smith, 5s. to 9s.; Sturmer, 4s. to 6s.; French Crab, 5s. to 6s.; Democrat, 6s. to 7s. 6d.; Rome Beauty, 6s. to 8s.; Yappeen, 7s. to 8s.

Many poor lines of fruit are to be seen on the Brisbane market at present, causing a general reduction in prices. The weather is now beginning to warm up; so Southern growers should take care to send only suitable varieties to this market.

Pears.

Brisbane.—Coles, 9s. to 11s. per case; Nelis, 7s. to 12s. per case; Josephine, 9s. to 13s. per case.

Occasionally consignments of pears arrive unwrapped. These lines inevitably open up specky. All pears for this market must be wrapped in order to arrive in good order.

VEGETABLES.

Cucumbers.

Sydney.—8s. to 12s. per bushel.

Carrots.

Sydney.—6s. to 8s. per cwt.

Beans.

Brisbane.—11s. to 15s. per sugar-bag.

Peas.

Brisbane.—7s. to 10s. per sugar-bag.

Lettuce.

Brisbane.—6d. to 1s. 6d. per dozen.

PUBLICATIONS.

A pamphlet on the marketing of strawberries is now available for distribution. "Harvesting and Packing Peaches and Nectarines" may also be obtained, together with a packing chart.

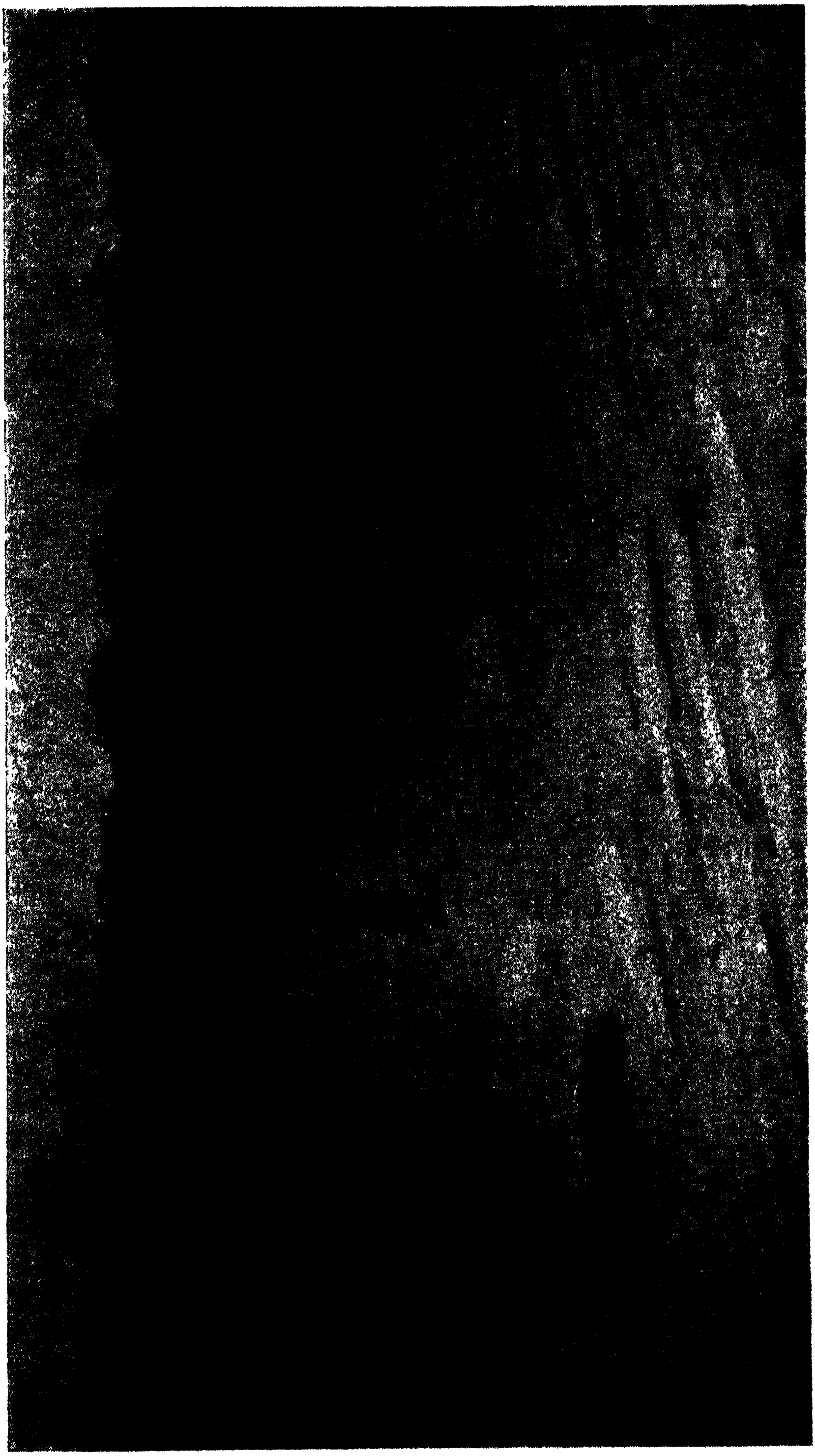


Plate 137.

A Peach Orchard, Bapaume, Stanthorpe District, Southern Queensland.

Plate 138.
Blossom Time in the Peach Orchard.

Plate 139.
Peaches ready to pick.

Plate 140.
In the Peach Growing Country, on the road to Glen Niven, near Stanthorpe.

Agricultural Notes

SUITABLE COTTON VARIETIES FOR THE 1937-38 PLANTING.

R. W. PETERS, Acting Director of Cotton Culture.

The bulk of the requirements of the Australian spinners for the coming season will be for cottons of $\frac{11}{16}$ to $1\frac{1}{16}$ inches in length. This will necessitate a greater growth of varieties producing these staple lengths than has been the custom in the past. The following recommendations therefore are made to assist farmers who have not grown such cottons before in selecting the most suitable variety of this type for their soils.

The best variety producing the shorter cottons on the alluvial soils of fair to good fertility in the Southern district and the South and Central Burnett districts appears to be the Half and Half, which has yielded very well in these areas during the last two seasons. It has not done well in trials in the Callide Valley, and cannot be recommended for that area. It has a medium-sized boll, which picks well when the variety is grown under favourable conditions, yields cotton around $\frac{15}{16}$ inches in length, and has a lint percentage of approximately 40. It should not be grown on soils of low moisture retaining ability, for adverse conditions markedly reduce the size of the bolls and the quality of the lint.

The Lone Star variety appears to be the outstanding cotton for most of the clay loam soils of the lower slopes originally covered with ironbark and box trees of the forest series; and brigalow, brigalow-wilga, and brigalow-belah of the scrub series. For several seasons this variety has yielded satisfactory returns on such soils in the Maranoa, the South, Central, and Upper Burnett, and the Callide Valley districts. It is rather a vigorous grower on fertile loamy soil, however, and therefore should not be planted on alluvial loams in districts likely to experience heavy mid-seasonal rains. It has large, well opened, easily picked bolls, produces fibre from $\frac{15}{16}$ to $1\frac{1}{16}$ inches in length, according to soil and climatic conditions, and yields around 36 per cent. lint for the bulk stocks, and up to 38 in some of the newer developed strains. It is undoubtedly a variety well suited for many of the districts, and should be grown wherever possible, as the lint is in great demand by the spinners.

Another big-bolled cotton that should be grown to the fullest extent is the Miller variety, which has given excellent results on the clay loam soils of the lower forest and scrub slopes, as well as on the alluvial clays of moderate fertility in the Wowan, Callide Valley, Upper Burnett, South Burnett, and Southern districts. It is earlier fruiting than Lone Star and can, therefore, be planted on more fertile soil, but requires greater moisture than does the latter variety, thus making it a better cotton for the heavier soils of the slopes in the coastal areas. The bolls are very large, and are picked with exceptional ease, particularly on cultivations following grassland; the fibre is the fullest bodied of any cotton grown here, and averages around an inch in length, with a 35 lint percentage. As a rule rather high grades of lint are obtained with Miller, for the fibres clean up well in the ginning operations.

Cliett is a big-boll variety that competes with Lone Star and Miller under certain specialised conditions, but is not recommended for distribution except where carefully conducted tests have indicated its superiority.

Mebane is a nice type of big-boll cotton that produces excellent fibre on sandy soils overlying clay in the drier districts and on the harder clay melon-hole soil types of the brigalow scrub, where it gives very satisfactory results. It is not suited to the better soil types, however, owing to a tendency to make rank growth on such soils under good rainfall. Under suitable conditions it is a good picker, with a 38 lint percentage, and produces fibre ranging from 1 to 1 $\frac{1}{16}$ inches in length.

The most promising of the shorter cottons for the fertile alluvial loams in the Upper Burnett, Callide Valley, and Wowan districts appears to be the Ferguson variety, which has yielded well in varietal tests, and many of the commercial trials during the last two seasons. It is a relatively new variety, but appears to have distinct possibilities of supplanting the Durango, Starvale, and Indio Acala varieties in these areas, particularly if it is grown on new or grassland cultivations. It produces a nice style of $\frac{15}{16}$ to 1-inch cotton, has a 37 lint percentage, and a boll of medium size which opens and picks well.

It also will be necessary to produce a reasonable amount of 1$\frac{1}{8}$-inch cotton, and farmers who have obtained satisfactory yields of high-grade cotton with Durango and Indio Acala should continue to grow these varieties. It is advised, however, that there is little market for the softer or yellow-spotted grades of these longer cottons, and where growers have received mostly yellow-spotted grades they should try either Miller or Ferguson, for apparently their conditions are not suitable for the longer cottons. It is stressed though, that there is a bigger factor of safety for obtaining satisfactory yields of cotton of good quality from all varieties, during the first three or four seasons following the breaking up of grassland. After that, the changes in the chemical and physical condition of the soil that occur with further cotton cultivation make it necessary that the varieties be selected very carefully to suit the soil and climatic conditions.

It is strongly recommended that when in doubt as to the best variety, the farmer should apply for advice either to the field officer of the cotton section of the Department of Agriculture, stationed in his district, or direct to the Department of Agriculture and Stock, Brisbane, for a large amount of evidence has been collected as to the merits of the different varieties which would be of assistance in determining the best variety, if the soil type is described.

Plate 141.
Crop and Pasture Land near Killarney, South Queensland.

MILLETS IN CENTRAL QUEENSLAND.

W. R. STRAUGHAN, Instructor in Agriculture.

Owing to the absence of winter rains many dairy farmers have areas of cultivated land under fallow which they were unable to plant with winter cereals, and now that the period for the planting of such crops is past some alternative summer growing feed undoubtedly is needed. The quickest growing fodder crops are the millets. Since the preparation of the land for winter cereals has been shallower, probably, than that necessary for maize and sorghums, millets should give the most profitable returns.

The millets—Japanese, white panicum, and giant setaria or giant panicum—are hardy plants and stand dry conditions well. They are quick growing, and have supplied material for grazing within six weeks of planting. These plants, however, should not be grazed before the roots are sufficiently strong to avoid their being pulled up by stock; and where judiciously grazed under favourable weather conditions, a good ratoon crop may be expected of them.

Where the green feed is not required, millets make a good quality hay if cut when the seed heads are formed and before the seed has developed. A delay in cutting occasions loss in several ways, and it is better, if there is any doubt as to when the crop is to be cut, to err on the side of greenness rather than otherwise. If cut too green the hay may cause a slight scouring of stock; but if it is too well matured a loss of digestible plant nutrients will result. Further, if such a free-seeding crop is allowed to mature the scattered grain will cause trouble in subsequent crops by the resultant volunteer growth, and the seed, if carried into the haystack or shed, provides food for mice.

Quite frequently, with a desire to attain balance in their stock foods, farmers have sown cowpeas with the millets very successfully, thus increasing the protein content of their fodder and so improving their cream returns.

Millets, also, especially in combination with coarse-stalked crops—such as maize and sorghum—make excellent silage, and since they produce 10 to 12 tons of green material to the acre under good conditions they may be used most advantageously for that purpose.

Millets prefer a loam for maximum growth, but will grow on a wide range of soils; even poor lands, if sufficient moisture is present, will give payable yields. Early sowings can be made as soon as frosts are over and can be continued successfully until January and February. Only small areas should be planted in November and December to provide grazing, as the heavy summer rains in January are apt to prevent the harvesting of any surplus as hay.

For sowing 10 to 12 lb. of seed per acre are usually sufficient when broadcast and harrowed in. When sown for hay, or on rich soils, a heavier seeding (about 15 lb.) is frequently used with a view to producing a fine-stemmed crop. Too heavy a seeding (over 20 lb.), however, will not have this effect, since—especially during a short dry spell—the original stand is quickly reduced by competition sometimes even to meagre proportions.

Of the varieties white panicum is undoubtedly the most popular. A quick grower, it stools well and reaches a height of from 4 to 6 feet. It has a flat stem and makes a good bright hay of some commercial value. Japanese millet is slightly shorter in its mature growth, but is—especially in the earlier stages—an even quicker grower and heavier stooler than white panicum, and is most suitable for grazing. Giant setaria (or giant panicum) has also received some attention, and under favourable conditions good results are obtained. Under adverse conditions, however, it does not appear to give as good results as the other varieties.

The millets are also very useful in controlling summer weed growth, but, of course, should be taken out before the time arrives to begin preparing the land for autumn planting.

THE SACCHARINE SORGHUMS.

N. A. R. POLLOCK, Senior Instructor in Agriculture.

The saccharine or sweet sorghums provide a great bulk of nutritious fodder palatable to all classes of stock, and their general hardiness should commend them to all farmers seeking a sustained supply of stock food. They may be grown successfully throughout the State, and, while maize is popularly considered to be more nutritious, the difference of food unit values is very small and more than outweighed by the increased quantity of fodder usually produced by the sorghums.

Maize quickly deteriorates on reaching maturity or under dry weather conditions. The sorghums, however, are more retentive of their succulence. Even after frost the stems retain their characteristic sweetness, and this, especially when the crop has been planted in February or early March, ensures a supply of succulent feed for the early winter months. They will grow in a great range of soils, and, although slower of germination than maize and consequently more difficult to keep clean in the early stages of growth, will withstand even prolonged dry periods when established, and following such periods will make quick response to any favourable weather changes.

As a silage crop they are second in value only to maize, and under dry conditions their added succulence makes them even preferable. Sorghums, like other crops, make their maximum growth only when the land has been thoroughly prepared. When the food supplies require to be augmented rapidly planting on incompletely prepared soil may be excusable, but generally speaking that procedure is not regarded as good farming.

Sowings may be made either broadcast, when 10 to 12 lb. of seed per acre will be required, or in drills at the rate of 4 to 6 lb. of seed, according to the quality of the soil and the fineness of stem desired. Planting in drills is preferable, for although it is frequently claimed that broadcast crops have the advantage of being finer stemmed they are usually shorter of stature, and the average yield is generally lighter and harvesting more difficult. Sowing in drills allows of inter row cultivation —a distinct advantage. Cultivation should be regular enough to check weed growth, and thus conserve moisture, and should be progressively shallower to avoid root damage. A maize drill fitted with sorghum plates is quite suitable for sowing. A wheat drill, with appropriate outlets blocked, is also quite convenient. Failing a seeding machine the drills usually are opened by a plough or scuffler and the seed is dropped by hand and covered by the harrows.

The crop should be harvested when the seed has formed, and is commencing to harden, usually three to three and a-half months after sowing. In small areas harvesting is usually done by hand with a cane knife. In large acreages such a method is too slow and laborious and if a maize binder is not available, a sledge cutter will be found most convenient. Such a cutter can be made on the farm, and particulars regarding it are obtainable from the Department of Agriculture and Stock. It can be drawn by one horse. Light crops may be cut with a mower or harvested with a reaper and binder.

Stock should not be allowed access to the sorghums during the first few weeks of growth, or after a check due to dry weather. They can be fed safely when mature, or even earlier, provided that the fodder is allowed to wilt for a day or so after it has been cut. The risk of poisoning can be minimised by feeding molasses with the fodder.

Saccaline undoubtedly is the most favoured variety. Good crops attain a height of 10 to 12 feet and the stem is only moderately coarse. It is the most frost-resistant of the varieties under general cultivation, is sweet flavoured, and the seed is easily procured. White African is a very quick-growing variety in its early stages; but it is later in maturing. The stem tends to coarseness. It, however, is a very heavy yielder, although not quite so succulent as saccaline. It stands frost well.

Imphee or Planter's Friend is very similar to saccaline—though generally not so vigorous a grower.

Honey, an American importation, grows to a height of over 12 feet. The stem is thick, but it is particularly well supplied with juice of a characteristic sweetness. Some exceptionally heavy crops of this variety have been obtained, but seed is difficult to procure and the crop does not resist frost well.

Other varieties include Early Amber, a fine pithy-stemmed, early maturing variety which has gone out of favour; Collier, a fairly fine stemmed variety yielding well; and Cowper, a moderately early crop, giving very useful yields.

COWS ARE QUIETER WHEN DE-HORNED.

When properly and humanely done, the after effects of de-horning is scarcely noticeable in dairy cows. For a few days they may give a little less milk, but after that they quickly return to full production. They are quieter in the yard and no longer are in continual terror of attack from bullies at milking time. Contentment leads naturally to improved production.

Brisbane Exhibition, 1937.

Plate 142.

THE SHOW STOCK MUSTER FOR THE GRAND PARADE.—The Brisbane Exhibition provides one of the finest stock shows in the Commonwealth. Many of the leading families of the British breeds of cattle and horses—some from famous stud establishments in the United Kingdom—were represented worthily in the ring. The daily parade of the aristocrats of Queensland herds around the arena was among the most popular events of the Show.

Plate 143.

The Opening Ceremony at the Brisbane Show.—His Excellency the Governor-General, Lord Gowrie, V.C., P.C., K.C.M.G., D.S.O., inspecting his Cavalry Escort and Naval Guard of Honour.

Plate 144.
The Governor-General's Naval Guard of Honour from the Royal Australian Navy at the Opening of the Royal National Show, Brisbane, on 18th August.

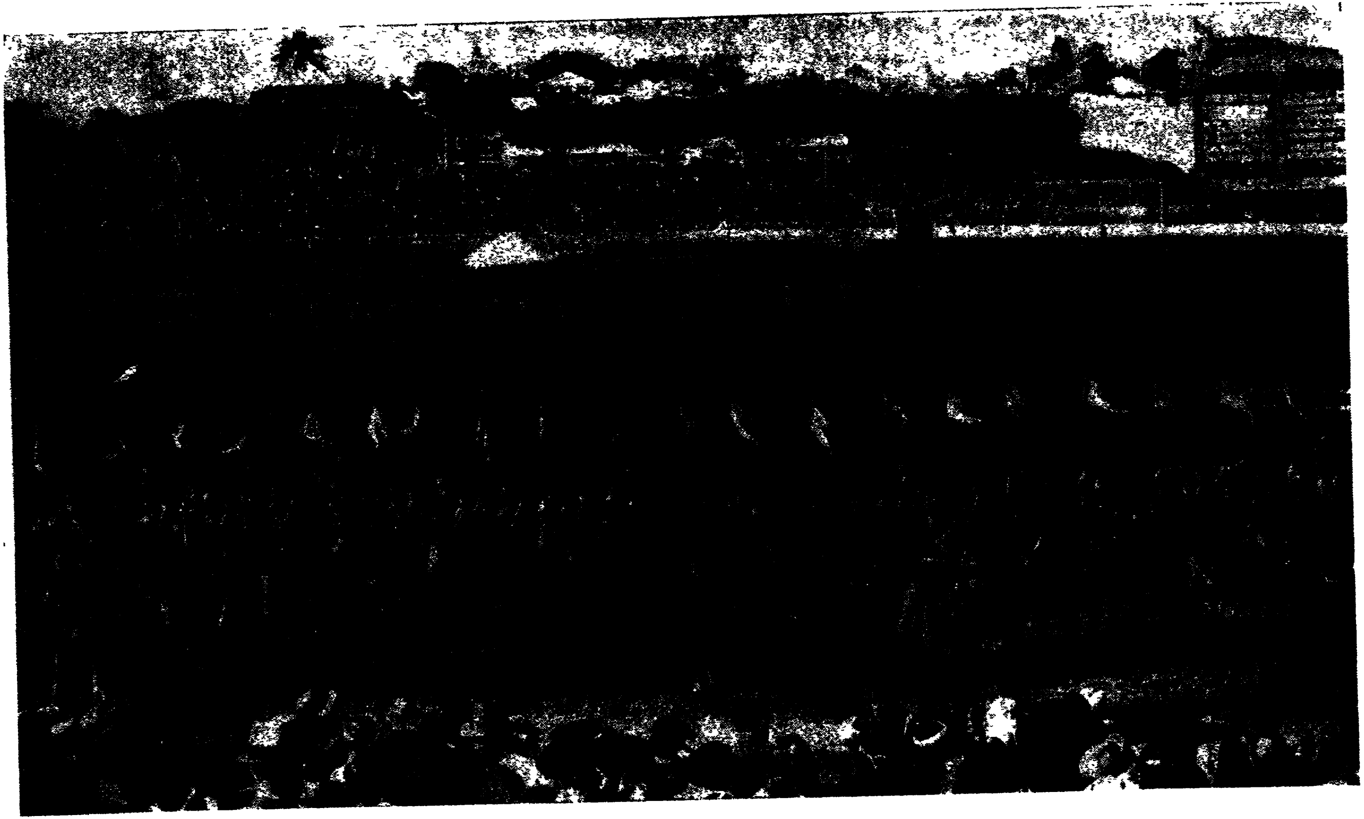


Plate 145.

THE GOVERNOR-GENERAL'S CAVALRY ESCORT.—This troop of Australian Light Horse (Volunteer Militia) consisted of men from the country who are engaged actively in rural industry.

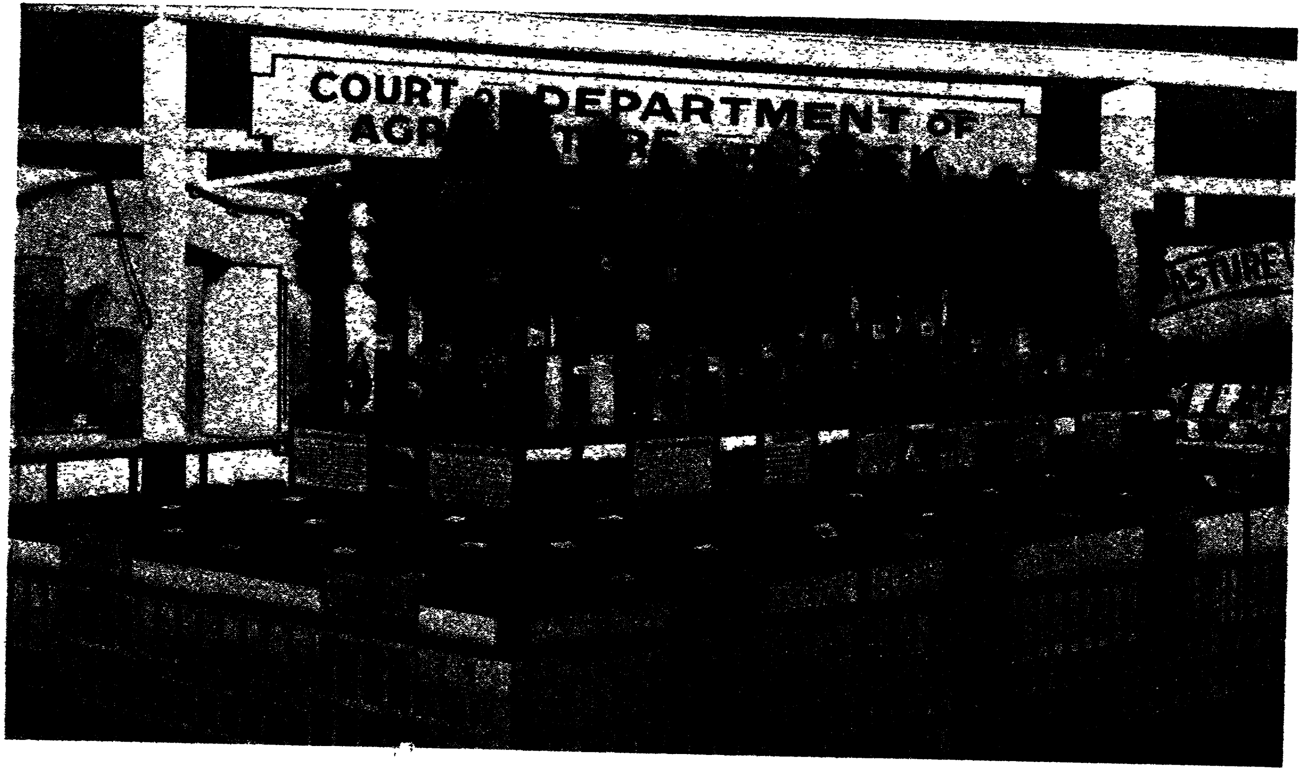


Plate 146.

THE WEALTH OF QUEENSLAND'S GREAT GRAIN REGION.—The central trophy in the Court of the Department of Agriculture and Stock was evidence of the plant breeders success in evolving wheats suitable to Queensland conditions of summer rainfall. It illustrated also the progress made in maize production and the propagation of new varieties. The whole lay-out of the Court was a credit to the designer, Mr. Stanley Burchill, of the Agricultural Branch.

Plate 147.

PRODUCTS OF A FRUITFUL COUNTRY.—Excellent specimens of the numerous temperate and tropical fruits grown commercially in Queensland were included in this impressive display of the Fruit Branch. Working models of various mechanical contrivances used in the orchard and packing shed added to the interest of a great exhibit.

Plate 148.

"ALL FLESH IS GRASS"—A striking panel of pasture grasses emphasised the truth of the Scriptural dictum. Probably 80 per cent. of Queensland's wealth is derived from nutritious indigenous and introduced grasses.

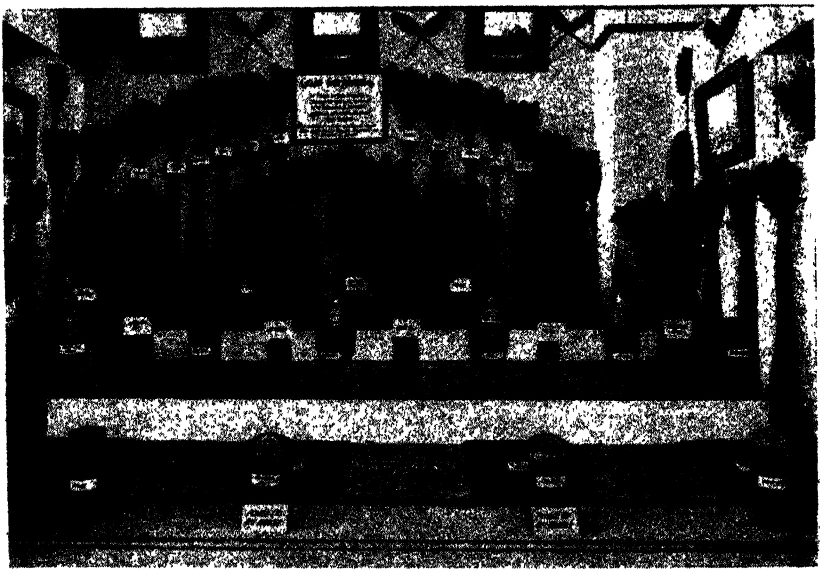


Plate 149.

A DISPLAY OF GRAIN SORGHUMS.—In Queensland a considerable area is sown annually with sweet or feed types, which are valued as fodder and silage—suitable varieties being Saccaline, White African, and Imphee. The grain types are not grown to a similar extent, but in view of their capacity to yield heavy crops of nutritious grain under severe climatic adversity, which would be fatal to successful maize production, it is considered that a larger area could be cultivated for grain. An alternative feed grain produced economically would be welcomed by the pig and poultry industries.

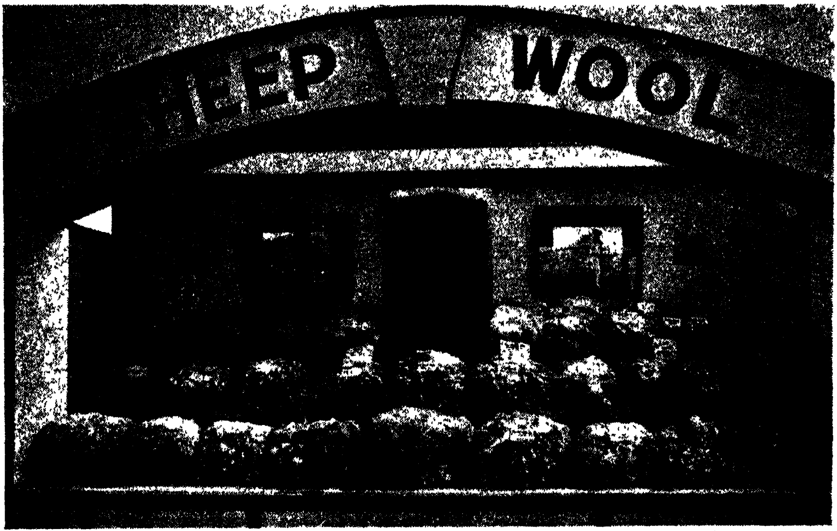


Plate 150.
QUEENSLAND'S WEALTH IN FINE MERINO FLEECES.

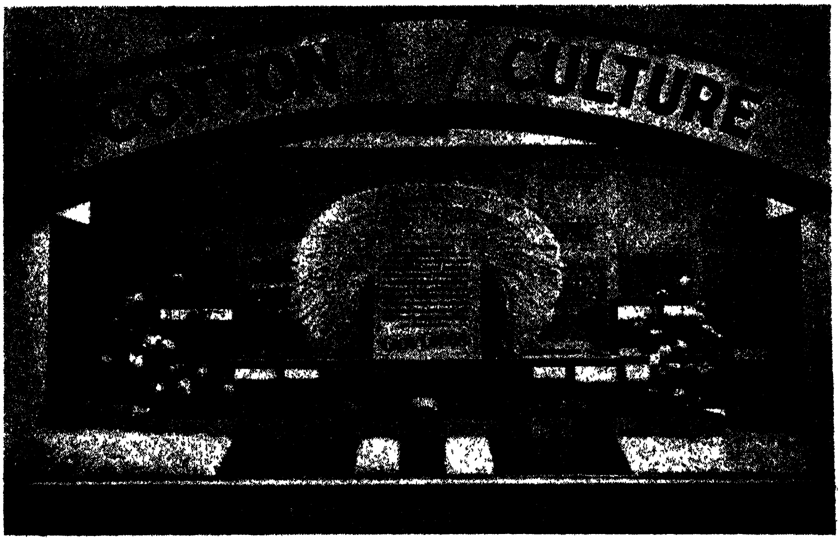


Plate 151.
QUEENSLAND LINT FOR AUSTRALIAN LOOMS.—High spinning quality is a characteristic of Queensland fibre. The Cotton Alcove contained impressive evidence of the importance of a new and staple industry.

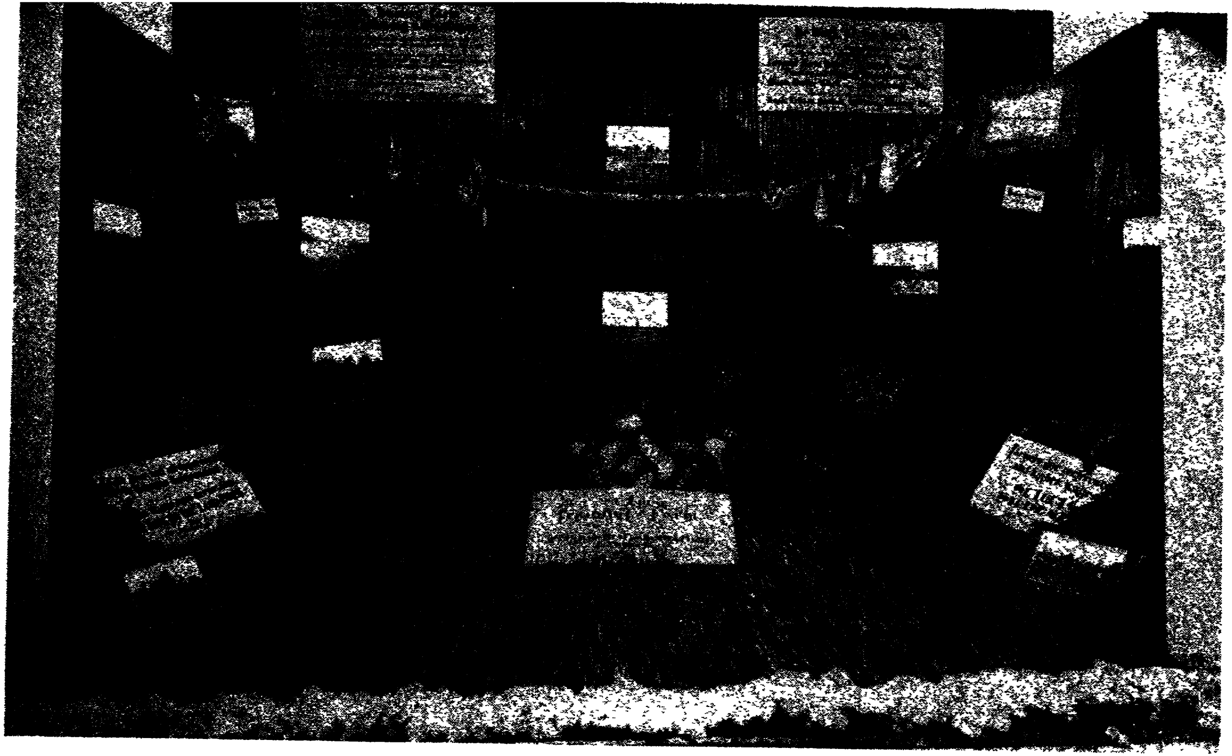


Plate 152.

PRODUCE FROM ST. LUCIA FARM SCHOOL.—A corner of the Court of the Department of Agriculture and Stock in which was displayed samples of crops produced by city boys undergoing training for a country career. A free six months' practical farming course for youths and young men is available at St. Lucia. A thorough grounding in the rudiments of every branch of farm work is given amid beautiful rural surroundings on fertile land fronting a reach of the Brisbane River. At the end of the course a farm job for every trainee is guaranteed. Farmers' demand for St. Lucia trainees is far in excess of the number of boys available. This fact is a further demonstration of the practical value of the training that the Farm Training School provides.

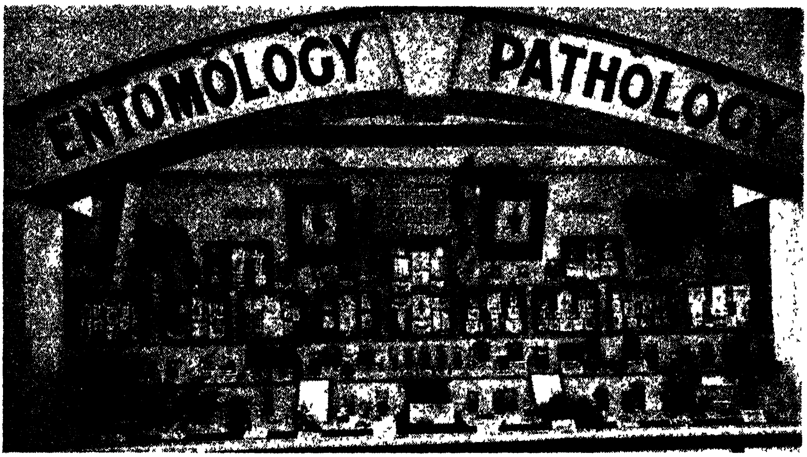


Plate 153.

SCIENCE SERVES THE FARMER.—The place of Economic Entomology and Vegetable Pathology in Rural Economy was shown in a striking way by this well-arranged display.

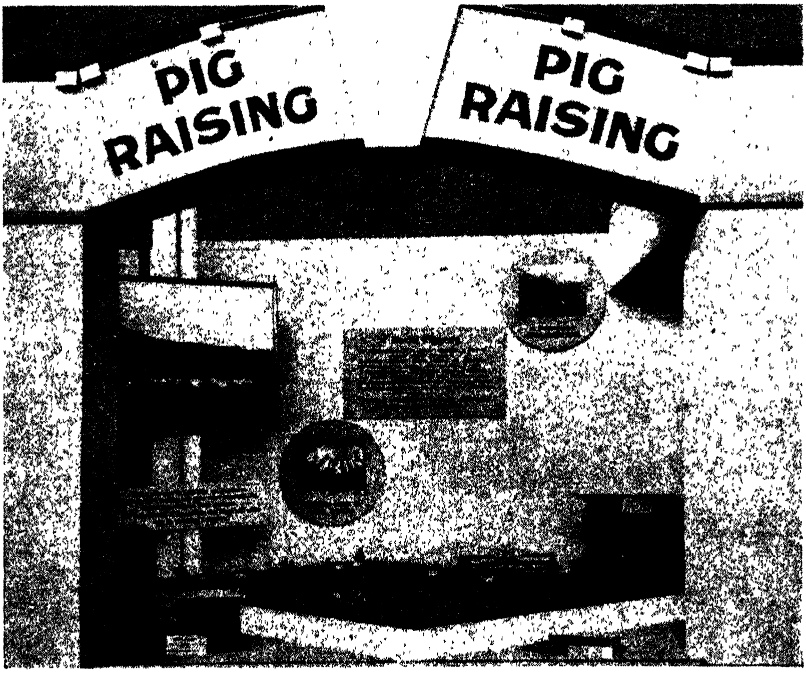


Plate 154.

A MODEL PIG FARM.—Complete in every outdoor detail, in an alcove of the Departmental Court was a centre of popular interest. Pig raising is a firmly-established and rapidly-expanding industry in Queensland. An export trade in frozen and chilled pork has developed remarkably in recent times. Throughout the year an active educational campaign on carried on, and this display illustrated the effectiveness of that work.

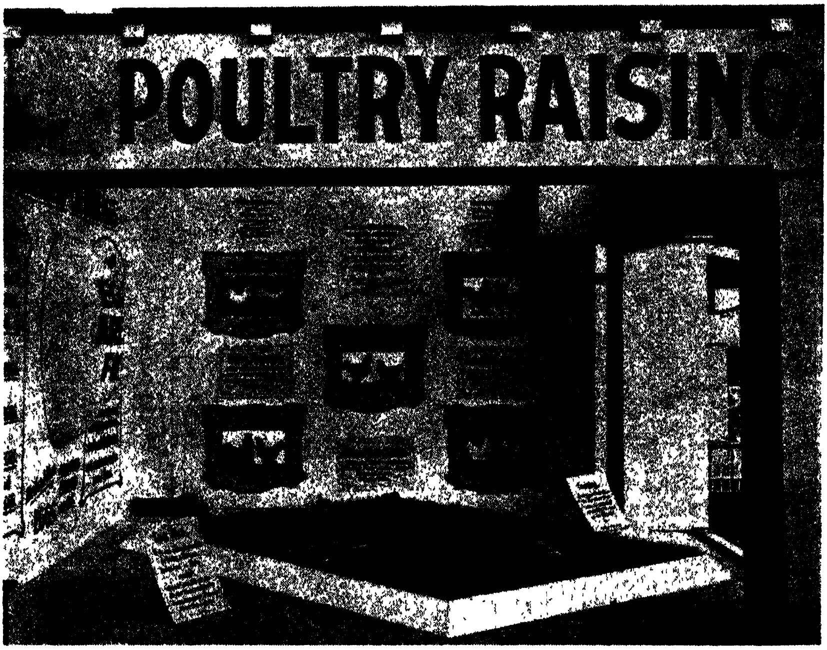


Plate 155.

A MODEL POULTRY FARM was the central feature of this interesting exhibit. The poultry industry in Queensland is now approaching £1,000,000 in annual value.

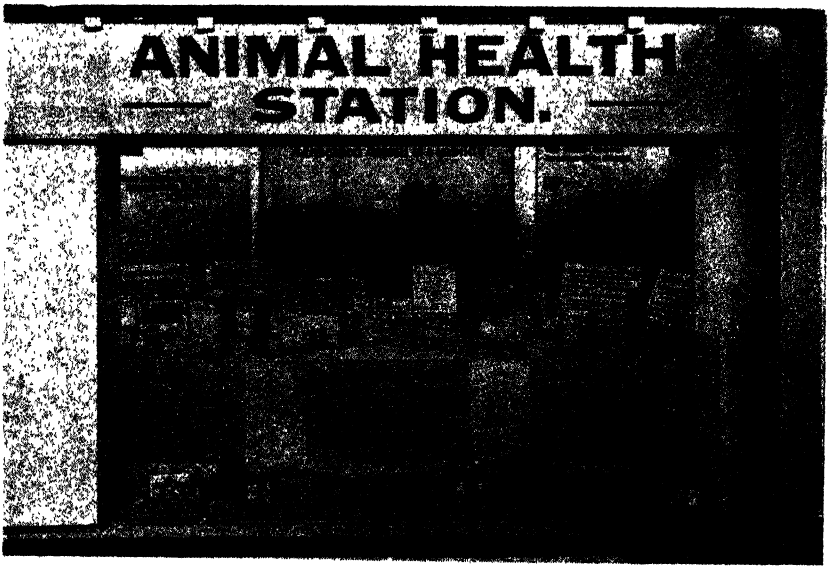


Plate 156.

"A DISEASED ANIMAL IS A LIABILITY."—Some of the activities of the Animal Health Station at Yeerongpilly were illustrated impressively and effectively in this corner of the Agricultural Court.

QUEENSLAND DEPARTMENT OF AGRICULTURE AND STOCK
INFORMATION SERVICE FOR FARMERS.
Agricultural Journal

Plate 157.

The Journal Alcove in the Departmental Court. A rendezvous for visitors from the agricultural districts of the State, both far and near. Arthur F. Crees and Tom Stevenson are the young officers in charge. Other officers associated with the several divisions of the Department of Agriculture and Stock were in attendance to advise show visitors on matters connected with the exhibits and the laboratory and field work of the Department generally.

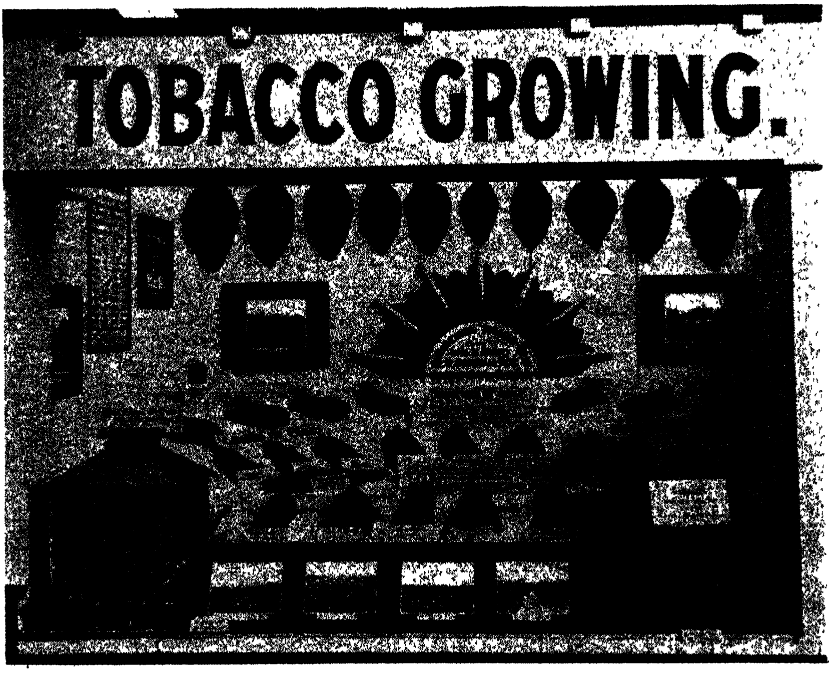


Plate 158.

To Go Up in Smoke.—The high standard of quality of Queensland leaf for pipe, cigar, or cigarette was well exemplified in this array of exhibits representative of every tobacco-producing district in the State.

Plate 159.

WEST MORETON WINS AGAIN.—Pillars and arches of sugar cane, blending in well-toned tints, were included in the decorative features of the A Grade District Exhibit, to which was awarded the place of honour. Pastoral, agricultural, mineral, and industrial products from one of Queensland's most progressive provinces were assembled in one comprehensive display.

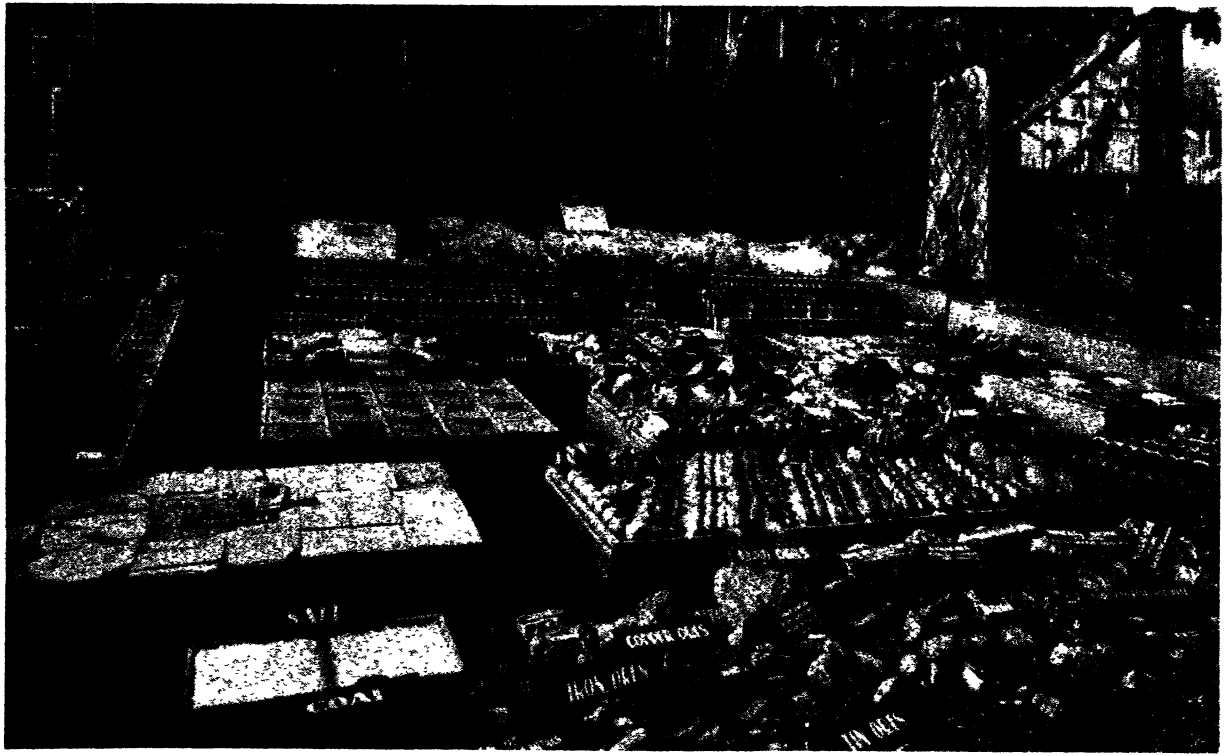


Plate 160.

THE AGRICULTURAL AND MINERAL WEALTH OF THE CENTRAL BURNETT.—Pillared, panelled and pallisaded with multi-coloured sugar cane, and replete with the products—all of a high standard of excellence—of the field, factory and farm home, this exhibit from the Gayndah district was a striking representation of the industry and the richness of natural resources that made it possible.

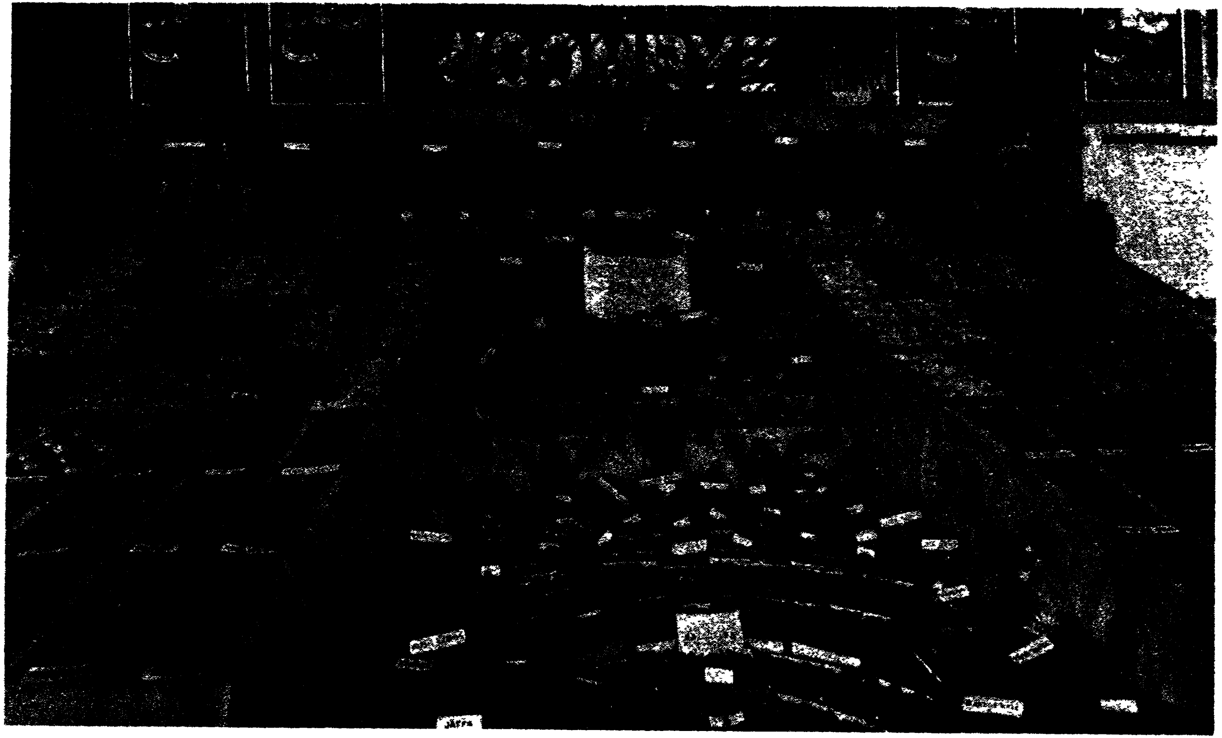


Plate 161.

THE WEALTH OF WOOMBYE FRUIT LANDS.—This fine display of temperate and tropical fruits typified the wide range of horticulture practised successfully on the near North Coast.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Jersey Cattle Society, production charts for which were compiled during the month of July, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter. Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS				
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Model VI. of Alfa Vale (365 days)	W. H. Thompson, Alfa Vale, Nanango	14,251·1	592·462	Reward of Fairfield
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Laguna Venus II.	F. G. Lamkin, Moola, Dalby	8,759·45	344·819	Morden Marcus
Glenore Ginger (272 days)	A. M. Johnson, Gracemere	7,204·95	274·771	Sunnyview Union Jack
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Glenore Heiress	A. M. Johnson, Gracemere	8,052·45	295·263	Sunnyview Union Jack
Blyth Alpha 1st	A. M. Johnson,Gracemere	7,571·6	278·413	Blacklands Headlight
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Rosenthal Milkmaid 10th	M. C. and A. M. Sullivan, Pittsworth	7,004·23	275·65	Rosenthal Carbine
JERSEY.				
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Pineview Clementine	F. Maurer, Darra	6,383·6	362·1	Buttercups Noble
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Retford's Hope of Hamilton	J. Wilton, Raceview	7,652·25	461·269	Retford May's Victor
Woodlands Fashion	D. R. Hutton, Cunningham	5,741·75	294·932	Kenmore Victor
Bellgarth Viola II.	D. R. Hutton, Cunningham	5,184·	282·961	Trecarne Renown II.
Carnation Princess Victoria	D. R. Hutton, Cunningham	4,634·77	241·714	Vincheles Golden Victory

The Tropics and Man

WATER AND SALT.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology,
University of Queensland.

Second Series: No. 2.

IN the last article we saw that the skin blood-vessels dilate under hot conditions, and it sometimes happens that there is not enough blood to fill the blood-vessels, with a consequent bad effect upon the working of the different parts of the body. This condition is made worse, of course, if the amount of blood is reduced at the same time. Such a reduction must occur if the body is losing more water than it is taking in.

"Most Important Factor."

About 65 per cent. of the body is water. Man sometimes can stand a reduction to 45 per cent., but beyond this death will occur. The supply of water is a much more important factor than the supply of food in the early days of a period of privation. This was demonstrated clearly in the recent air disaster on the Lamington Plateau. This insistent demand for water is due to its unique property of dissolving a large number of substances.

Nearly all the intricate and delicate chemical processes upon which life depends are carried out in solution, and if water is taken away they must go wrong or cease altogether. We have seen also that the blood cannot circulate unless enough water is present to allow the blood to fill the vessels and to run freely in the vessels. Blood in men dying from thirst is so thick that it hardly runs from veins when they are cut. A peculiar thing is that even in these people the kidneys go on secreting small quantities of urine and continue to excrete waste products.

Points About Water Drinking.

Water is lost from the body in three ways—from the lungs in the breath, from the skin as insensible perspiration and as sweat, and from the kidneys and alimentary canal in the excreta. Under normal conditions, we drink more water than we require to replace our losses, and the excess is passed out by the kidneys. If the loss of water by one of these channels becomes excessive, as it certainly does during hard work under very hot conditions (2 lb. of sweat an hour), then the ordinary intake is no longer enough. The sensation of thirst is some indication of our need for water, but is not always a reliable guide. It is better to take enough water to prevent thirst occurring than to wait for thirst to sound the warning. The volume of urine may be reduced quite definitely without thirst being noticeable; in fact, this is the usual state of affairs in the tropics. It probably is unwise to allow the reduction in urine to continue day after day, as there is some evidence that the occurrence of "stone" is increased thereby. Another point about water drinking is that it probably is better to take small drinks frequently than large drinks periodically. The taking of a large drink causes a burst of sweating in many people, which, to a certain extent, undoes the good done by the drink. Such sweat, too, runs off the body without evaporating, and is wasted as far as cooling the body is concerned.

Effects of Dehydration.

The first outstanding effect of water deprivation upon the body's working is upon the blood circulation. The volume of blood is reduced and it becomes increasingly more difficult for the body to keep its vessels filled. As a result, all the body tissues are affected, but the nervous system is the first to show these effects. We noticed the symptoms last time—tiredness, irritability, lack of concentration, faintness. Partly through this and partly through lack of sufficient fluids, the working of the digestive system is upset. Loss of appetite, "indigestion," constipation and interference with food absorption occurs. Spices, laxatives, and alcoholic stimulants are frequently indulged in with little lasting effect, when a very simple preventive is to hand—the drinking of sufficient water. That familiar sensation of fatigue in hot weather is due in large part to lack of water. The muscles are dehydrated, their salt balance is disturbed, and the nervous system supplying them is upset for the same reasons. Usually things do not progress much beyond this stage but, even so, this stage occurs far more commonly than it need and takes a large toll in lowered efficiency and predisposition to fatigue. If dehydration progresses, however, the circulation of the blood, impaired by lack of water, often leads to disordered chemical behaviour in all the tissues of the body, so that excessive amounts of acid materials are produced, and these accumulate because the poorly-working kidneys cannot get rid of them. All these things combine in speeding each other up and forcing the body to a crisis.

Salt Loss from the Body.

The importance of salt to the body has been appreciated since the days of the primitive peoples, and its importance to men working on hot jobs was recognised early in this century. The wave of enthusiasm for the newly discovered parasites as the cause of tropical disease, however, tended to obscure its recognition by the large majority of white dwellers in the tropics. It is only recently that its full importance has been realised.

The blood contains 0·6 per cent. of salt. When one starts to sweat profusely through work in a hot atmosphere, the sweat contains only a little salt, say 0·1 per cent., but as the sweating continues, the percentage rises to that of blood. People vary a good deal in the salt content of their sweat, and one thing we are trying to discover is whether this is in any way related to their ability to withstand hot climates, and also the effects of acclimatisation. (I, for instance, have much less salt in my sweat than my London colleagues.)

Men working hard in hot climates lose a great deal of salt. This must be replaced, and in hard workers, this means the addition of a liberal amount of salt to the food.

Effects of Salt Lack.

The first effect of salt lack is the reduction of the amount of salt excreted by the kidneys. This is a protective measure and suffices for short periods. The second effect is the mobilisation of salt from stores in the body. Some people have good stores. (I was unable to exhaust mine even when I lived on a strictly salt-free diet for a week and lost several pounds of sweat each day.) Others have almost none. (The blood salt of one of my subjects fell by one-quarter while sitting in a hot room for six hours.) When these protective measures fail, the blood salt begins to fall. When it falls about one-third, muscle cramps begin—miner's cramp or stoker's cramp. These may be most violent and excruciatingly painful, and men may die even in an attack. Dramatic relief is obtained by injecting strong salt solution.

Apart from the severe effect of marked reduction in the body's salt content, there are probably many more subtle disturbances associated with a chronic salt deficiency insufficient to produce cramps. It is thought that the failure of sweating sometimes seen in hot dry countries, as a prelude to heat stroke, is due to salt lack. It has recently been discovered that the salt and water content of the body come partly under the control of a ductless gland, known as the adrenal cortex. Extracts from this gland relieve certain cases of neurasthenia. This raises the question as to whether tropical neurasthenia is associated with chronic mild salt lack.

Rules for Prevention.

1. Take *plenty* of fluids in hot weather, especially if doing manual labour.
2. Take frequent small drinks rather than a few large drinks.
3. Use laxatives and appetising spices only with discretion; seek to remedy the cause of the trouble.
4. Add salt plentifully to the food; the body can get rid of excess, but it cannot make up a deficiency.
5. All these rules apply even more forcibly in hot dry climates.

[*Photo: P. P. Comiskey, Stock Branch.*

Plate 162.

CROSSING THE GEORGINA.—The "lead" of a mob of Brunette (North Australia) bullocks, travelling south, crossing one of the channels of the Georgina River, at the "One Mile," near Urandangie, West Queensland.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Prickly Supple Jack.

J.J.S. (Helidon)—

The specimen you sent is *Smilax australis*, commonly known as Prickly Supple Jack. It is a very common plant in Queensland, particularly on hillsides in heavily forested country. It is not known to possess any poisonous qualities.

Grasses and Weeds.

G.H. (Booinbah, via Goomeri)—

1. ***Senebiera didyma***, bitter cress. A very common weed in cultivation in Southern Queensland. It is one of the worst milk-tainting weeds we possess.
2. ***Xerotes*** sp., mat rush. A book, "The Principles of Botany for Queensland Farmers," shortly to be published by the Department of Agriculture and Stock, Brisbane, either free or at a small charge, will give you the difference between sedges, grasses, and rushes. You should get your head teacher to obtain a copy for your school library.
3. ***Malva parviflora***, marsh mallow.
4. ***Chloris divaricata***, a native chloris or windmill grass. The native chloris grasses are very valuable fodders, particularly for sheep. When closely grazed they make a thick sward.
5. ***Sporobolus Berteroanus***, Parramatta or rat's tail grass. This grass is an inferior fodder. It has caused some trouble of recent years through its invasion of the better paspalum patches.
6. ***Bothriochloa decipiens***, bitter blue grass. An inferior blue grass sometimes known as coastal blue grass. It dominates many pastures due to the more palatable species having been eaten out. ***Setaria*** sp., a pigeon grass.
7. ***Dicanthium sericeum***, blue grass.
8. Seed heads required for determination.
9. ***Stachys arvensis***, stagger weed, also called wild mint, not to be confused with the mint weed of the Pittsworth area, which has received so much publicity of recent years owing to its poisonous properties. The present plant is a common weed of cultivation, particularly during the winter and spring months. It is quite a good fodder for dairy cattle, calves, and resting stock. It causes staggers and shivers in working horses and also stock that are travelling.

Shade and Shelter Trees.

G.C.B. (Wandoan)—

The following shade and shelter trees may be suitable for your purpose:—Kurrajong, bottle tree, pepper tree, white cedar, sebizzia lebbek, Burdekin plum, Portuguese elm. These could be obtained from the Director, Botanic Gardens, Brisbane, the charge being 2s. per tree. It is possible that you could obtain some of these trees, or other suitable trees, from Mr. L. Burbank, a nurseryman of Chinchilla. The Department has no trees for distribution. Both the wilga and the cypress pine are ornamental trees, and excellent for shade purposes. The wilga is often eaten by stock, and is of value on that account. You may be able to obtain seedlings of these trees somewhere in your district. Specimens of plants for identification should be sent to the Government Botanist, Botanic Gardens, Brisbane.

Poisonous Plants.

W.R. (Petrie)—

Swainsona luteola is a plant related to the indigo or Darling pea, and has been proved by feeding tests to affect stock in much the same way. Animals are said to have a crazed appearance for some time after eating the plant, and they have been taken off it. It is quite common in Queensland, and has several times been sent to us as a suspected poisonous plant. We have not heard a common name given to it.

Lotus australis, the native bird's-foot trefoil, frequently called Barwon lucerne, is generally regarded as an excellent fodder plant; but, like the frost-resistant Rhodes grass, sorghums, and some other plants, contain a prussic-acid-yielding glucoside. Losses from it among ordinary paddock stock, however, are rare. It is moderately common in Queensland, but little trouble with it has been experienced.

Under Suspicion.

L.L.M. (Charleville)—

1. *Euphorbia Drummondii*, caustic weed. This plant has been found to be cyanophoric in New South Wales, but repeated tests with Queensland specimens have always yielded negative results. Symptoms as almost given universally by stockowners are not those of typical HCN poisoning. The head and neck of the affected sheep swell considerably. If this swelling is pierced and an amber coloured fluid exudes, the life of the sheep may be saved.
2. *Cucumis myriocarpus*, paddy melon. A native of South Africa now widely spread in many countries. It is a very common weed in Queensland. Both in Queensland and New South Wales it is said to have caused blindness in horses. So far as we know nothing definite has been proved against the plant in Queensland. In South Africa the juice has been found to be toxic.
3. *Eremophila maculata*, native fuchsia. A very common plant in many parts of the West. It is strongly cyanophoric. Most losses with it, however, as in some cases of cyanogenetic plants, seems to be from travelling stock, ordinary paddock resting stock frequently browse on the plant with impunity. In fact, most graziers look on it as quite a good fodder.

"Very Poisonous."

E.K. (Cunnamulla)—

Your specimen represents a species of *Datura* or thorn apple. It is difficult to say from a single leaf what actual species it is, but it looks like the common garden species, *Datura Cornucopia*. All species of *Datura* are very poisonous, and if your cows and calves had access to some of these plants, and have eaten any of them, it is more than likely they are the cause of the trouble.

Hog Weed.

M.R.M. (Mundubbera)—

The specimen represents *Trianthema decandra*, frequently known as hog weed, which is very common in Queensland. It is not known to possess any poisonous properties, and so far as we know has not come previously under suspicion as a poisonous plant. It belongs to a wholesome family of plants (*Aizoaceæ*), closely allied to the pig weeds. Some of the smaller members of the genus *Trianthema* are very common on the Western pastures, and are looked upon as quite good cattle feed.

Species of Roly Poly.

M.G. (Umbercollie, Goondiwindi)—

Your specimen is a species of roly poly, *Bassia tricuspis*, a native plant very closely allied to the galvanised burr. It is a very common weed in many parts of Queensland, particularly on the Darling Downs and in the Maranoa district. So far as is known the plant does not readily succumb to poisoning, or, at least, we doubt rather if poisoning would destroy the seeds it has all over it in tremendous quantities.

General Notes

In Memoriam.

JOHN NEWTON CREE.

The death of John N. Cree, formerly of the Maintenance Section of the Department of Agriculture and Stock, which occurred on August 10th is recorded with regret. The late Mr. Cree was born in 1864 at Bishop Auckland, Durham, England. He came to Queensland in 1884, and for many years was engaged in bridge building and other constructional work in different parts of the State. In 1912 he entered the service of the Department, in which he soon earned a high reputation for his industry, skill and faithful performance of duty—a reputation which he retained until his retirement in December, 1932. He is survived by his widow, a son and three daughters to whom sincere sympathy is extended.

Staff Changes and Appointments.

Mr. V. J. Brimblecombe, Gladstone, has been appointed an inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock, and will be stationed at Monto.

Miss M. H. Makings, Turner avenue, New Farm, has been appointed an assistant cane tester at Qunaba Mill.

Mr. N. E. D. Arthur, Inspector of Stock, Tibooburra, New South Wales, has been appointed also an acting inspector of stock for Queensland.

Constable R. W. G. Lake, Malbon, has been appointed also an inspector under the Brands Acts.

Sergeants (2nd Class) J. Doolan (Landsborough) and A. E. Wootton (Nundah) have been appointed also inspectors under the Slaughtering Act.

Mr. M. W. J. Patullo, Dalrymple Heights, Eungella, via Mackay, has been appointed an honorary ranger under the Animals and Birds Acts.

Mr. J. E. Ladewig, Stock, Slaughtering, and Dairy Inspector, has been transferred from Monto to Biloela.

Mr. J. A. Gresty, an officer of the Forestry Department stationed in the Lamington National Park area, has been appointed also an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Constable J. H. Hancock, Wowan, has been appointed also an inspector under the Brands Acts.

Mr. J. T. Littleton, Inspector of Stock, Innisfail, has been appointed also an inspector of brands. The Officer in Charge of Police at Oaks (Kidston) has been appointed also an acting inspector of stock.

Mr. James Cormack, Gin Gin Sugar Mill, Wallaville, has been appointed millowners' representative on the Gin Gin Local Sugar Cane Prices Board, vice W. C. Cunningham, resigned.

The following have been appointed honorary rangers under the Animals and Birds Acts:—Messrs. E. G. Gray, E. W. Carless, L. J. Dowzer, W. A. Elliott, R. F. Clark, H. Cox, E. J. Gould, C. G. Hawkins (Ayr), E. W. Ford, junr., W. Haller, W. G. Wall, F. J. Woods (Home Hill), J. Sexton (Brandon), L. Freeland, J. B. Blakeney, W. C. Bird, W. Ludwig, E. A. Robinson, M. B. Mayes, J. T. Dakers, H. Pemble, F. G. Hughes, and T. W. Hourigan (Giru).

Wild Life Preservation.

Orders in Council have been issued under the Animals and Birds Acts declaring the property of Messrs. Fitzpatrick at Lake Clarendon, via Gatton, and an area embracing Myall Creek, Dalby, to be sanctuaries for the protection of animals and birds.

Banana Industry Protection Board.

An Order in Council has been issued under the Banana Industry Protection Act providing for a levy on banana growers to be used for the maintenance of the Banana Industry Protection Board. The levy is at the rate of 1½d. per one and a-half bushel case, and 2d. in the £ sterling on bananas marketed in the bunch.

Pineapple Levy.

A regulation has been issued under the Fruit Marketing Organisation Acts extending for a further twelve months from the 21st August, 1937, the Pineapple Levy Regulation which was issued in April, 1936, and which empowers the Committee of Direction of Fruit Marketing to make a levy for the purposes of the abovementioned Acts on all pineapples marketed.

Peanut Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts extending the operations of the Peanut Board for the period from the 28th August, 1940, to the 27th August, 1947.

Peanut Board Election.

Result of the Peanut Board election (four members required:—

District No. 1 (Wienholt and Nanango), two members—Adermann, Charles Frederick, Kingaroy, 228 votes; Young, Leslie Vivian, Wooroolin, 204 votes; Christiansen, Norman James, Wooroolin, 101 votes; Crawford, Joseph Henry, Mannuen road, Kingaroy, 97 votes.

District No. 2 (Central Queensland), one member—Nothling, Rudolf Richard, Hut Creek, re-elected unopposed.

District No. 3 (Rest of Queensland), one member—Quilter, John Francis, Tolga, 40 votes; Gargan, John, Atherton, 31 votes; Humphrey, Sydney Harold, Tolga, 9 votes.

The sitting members for District No. 1 have been re-elected, and in District No. 3 Mr. Quilter will replace the present member, Mr. W. Whiting, who did not seek re-election this year.

The new Board will be appointed for a period of three years.

Council of Agriculture.

A regulation has been issued under the Primary Producers' Organisation and Marketing Acts prescribing the members of commodity boards who shall represent such boards on the Council of Agriculture. These include Messrs. J. McRobert (Maryborough) and W. J. Sloan (Malanda) (Butter Board), D. G. O'Shea (Southbrook) (Cheese Board), H. R. Brake (Wowan) (Cotton Board), T. D. McGeehan (Kairi) (Atherton Maize Board), C. Brumm (Woongoolba) (Arrowroot Board), C. F. Aderman (Kingaroy) (Peanut Board), R. V. Woodrow (Woodford) (Honey Board), E. Fitzgerald (Albany) (Barley Board), M. H. Campbell (Albany Creek) (Egg Board), H. Zischke (Hatton Vale) (Broom Millet Board), G. D. O'Neill (Allora) (Canary Seed Board), D. Johnston (Malanda) (Northern Pig Board), K. R. Hack (Nerang) (Committee of Direction of Fruit Marketing), G. Johnson (Mirani, Mackay) (Queensland Cane Growers' Council), W. J. Brimblecombe (Pirrinuan) (Wheat Board), G. A. Duffy (Forestry Department) (Plywood and Veneer and Northern Plywood and Veneer Boards).

Executive approval has also been given to the appointment of representatives of districts embracing Local Producers' Associations who shall be members of the Council of Agriculture. These are:—Messrs. R. R. Nothling, Hut Creek, via Ambrose (Central Queensland), R. H. Jamieson, Monto (Burnett), W. L. Osborne, Wondai (South Burnett), P. Daley, Maleny (Wide Bay), C. Bateman, Nundah (East Moreton), J. A. Sweeney, Mount Alford (West Moreton), J. Cameron, Lavelle (Darling Downs), W. E. Ashford, Hannaford, via Dalby (Western Downs), and C. W. Roseblade, Yungaburra (Atherton Tableland).

Cotton Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, amending the constitution of the Cotton Board in respect of the establishment of a revolving fund in connection with the working account reserve fund moneys deducted from net realisations due to cotton growers

Rural Topics

Overstocking of Pastures.

That a large proportion of the most productive pastures of the State, coastal as well as inland, are overstocked is an undeniable fact. Unfortunately, too, the recent drought in the coastal areas has emphasised the harmful results of overstocking. The farms which were very much overstocked before the drought had the heaviest losses through its incidence. Many farmers and pastoralists are fully conscious of the bad effects of overstocking on pastures, and a large proportion of them insist on a moderate and judicious stocking of their holdings. As a consequence they are frequently very successful in good seasons and are the last to be affected by adverse seasons.

In a large proportion of cases, overstocking is due to economic conditions. Landholders often feel compelled to stock their properties to the limit during favourable seasons. Any general attack on the problem of overstocking, therefore, must inevitably involve financial considerations. It, however, is advantageous, invariably, even from the economic standpoint, not to overtax the productive capacity of the pastures.

Pastures which are not heavily stocked usually make rapid growth in the late summer and autumn, when the rainfall is sufficient. This is the case notably in some of the best paspalum pastures on the coast. This excess growth of grass is not eaten by stock, and when dry serves to protect the younger growth of grass from frost during the winter. With the approach of spring the younger growth of grass makes rapid headway, and forms a luscious pasture for stock. The general fertility of the soil of a pasture maintained in this way deteriorates much less rapidly than that of a pasture which is overstocked. The excess grass as it lodges and rots is added to the soil, and augments its organic constituents. Although this surplus late summer grass has a comparatively low feeding value on account of its low protein content, it has a high manurial value. It is composed very largely of organic matter which after decomposition has a marked reducing effect on essential soil minerals such as iron. It is due to this reducing effect of these organic constituents that the iron in the upper layers of the soil becomes soluble and available to pasture plants, fruit trees, and other economic crops.

—*W. D. Francis.*

On Nappamerrie—A "Desert" Vignette.

The fine stone house is clear of sand; the garden is of bougainvillea, fan-palm and cedar; and before and below is a great lagoon eight miles long and half a mile wide. A reedy island rises from the centre of this lake, whose depth is as much as 60 feet. . . .

In these hot brilliant days—sun saturated—of the alleged winter travelling is a joy. The long wide plain—gently rolling country from horizon to horizon; roly poly, or as Americans call it, "tumbleweed," rotates before the gentle wind, sowing seed as it travels.

A mob of horses full of curiosity, tinged with fear, gallop towards the car, wheeling within 200 yards of us and galloping away again, but to return. There is energy in a diet of Mitchell grass, yellowing on its stalk to a self-made hay; a great kick in the herbage, although the rainfall is low enough almost to justify the professors who study only tabulated rainfall and speak of the country as "desert."

Galahs by the thousand wheeling all at once, so that the sunlight strikes a flash of pink from their thousands of breasts; kangaroos bursting out of a scrub belt, rushing to concealment in another—life, warmth, sunlight, hot days, and cool nights, that are the ideal conditions for the production of Australia's finest wools. This is the "desert" of the text-books.

—*Randolph Bedford in "On the Western Edge."*

Orchard Notes

OCTOBER.

THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture may be again emphasised. Thorough cultivation of all orchards, vineyards, and plantations therefore is imperative if the weather is dry, as the surface soil must be kept in a state of soil mulch, and no weeds of any kind must be allowed to grow, as they act only as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants.

All newly planted trees should be watched carefully and if they show the slightest sign of scale insects or other pests they should receive attention at once.

Bananas.

In the warmer districts banana planting may be continued. All winter trash should be removed and the stools cleaned up. If not already done, before the winter, young plantations planted the previous season should be desuckered without delay. Those desuckered last autumn should be gone over again, and old plantations also should receive attention. Grow to each stool the number of stems which experience proves to be permissible, but only allow each stem to grow a single follower. Borers will be active again soon, and trapping should be intensified towards the end of the month and supplies of Paris green and flour (one part to six by weight) made up in readiness. Caterpillar and grasshopper plagues often occur from the end of the month onwards, and it is wise to lay in a supply of arsenic pentoxide for use in the preparation of bran baits. Watch the plantation carefully for bunchy top, and kerosene and destroy any affected plants without delay. The season of vigorous growth is now commencing, and it will pay well in more and better fruit and in stronger suckers for the next crop to apply a dressing of a complete fertilizer to each stool. Cultivate well to retain moisture, aerate the soil, and kill weeds before they seed. This will also prepare the soil for the planting next month of a green cover crop such as *Crotalaria goreensis*, thus shading the soil, preventing erosion on slopes, and enriching the soil with nitrogen and humus.

Clean out all banana refuse from the packing shed, and resolve not to allow it to accumulate in future. This will reduce the risk of the development of many fungous rots in the packed fruit.

Pineapples.

From now onwards pineapples may be planted in most districts. Plough thoroughly, remembering always that in the life of a plantation will be several years during which it will be neither possible nor desirable to do more than disturb the surface layer. Obtain advice from the Department of Agriculture and Stock as to whether the soil is sufficiently acid, and, if not, how much sulphur to apply. Care must be taken in the layout of the rows to save time and labour in cultivation and harvesting, and minimise erosion. Select planting material with discrimination from healthy and vigorous plants of a good bearing type. Beware of planting "collars of slips." Always strip off the base leaves and dry in the sun for a few days, and plant shallow. As soon as the roots form, apply 3 cwt. of 10-6-10 fertilizer to the acre. All established plantations are due for their spring fertilizer at the rate of not less than 5 cwt. per acre. Keep down weeds with the Dutch hoe; but do not disturb the soil deeply, always remembering that the pineapple is shallow-rooted and receives a sharp setback if the roots are interfered with by the use of horse-drawn implements. Clean out all pineapple refuse from the packing shed and surroundings, and thus eliminate much fungous trouble in the summer pack.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to the Granite Belt, and the Southern and Central Tablelands; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit very largely depends. The surface of all orchards and vineyards must be kept loose, and no weed growth of any kind should be allowed. In the western districts, irrigation should be given whenever necessary, but growers must not rely on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be looked after carefully and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with Bordeaux mixture and lime sulphur according to the schedule recommended by the Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not been treated already, do not delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop will not take long to harvest.

Where new vineyards have been planted, spraying also is very necessary, as if this is not done the young leaves and growth are apt to be affected so badly that the plant will die.

SHEEP LAND FOR GRAZING HOMESTEAD SELECTION.

Portions 1 and 4, parish of Whittingham, comprising part of Alice Downs resumption, will be open for Grazing Homestead Selection at the Land Office, Blackall, on Thursday, 7th October, 1937, at 11 o'clock a.m.

The portions are situated about 20 miles north-west of Blackall. The areas are 20,099 acres and 20,210 acres respectively.

Each selection will be for a term of twenty-eight years, and the annual rental for the first period of seven years is 3¾d. and 4d. per acre respectively. Each must be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years.

Portion 1 comprises open downs with some gidyea and boree forest, and portion 4 is nicely shaded first-class downs. Portion 1 is naturally watered, but portion 4 requires further artificial water. Both portions are well grassed with Mitchell, Flinders, barley, umbrella, and other grasses, and are suitable for breeding, woolgrowing, and fattening.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agents at Blackall and Barcaldine, and the Government Tourist Bureaux, Sydney and Melbourne.

Farm Notes

OCTOBER.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop.

WORMS IN SHEEP.

In recent times the problem of control of the parasitic worms in sheep has claimed attention in different parts of the world, more especially in South Africa, Great Britain, and Australia. Previously, drug treatment was successful only in the case of the stomach worm. Worms inhabiting the small intestine, e.g., the hair worms, and the large bowel, e.g., the nodule worm, were practically unaffected by drugs given in the ordinary way through the mouth. This was due to the fact that, under the conditions usually accompanying treatment, the drug passed into the first stomach or paunch and thus became diluted to such a degree that, by the time it passed through the three remaining stomachs of the sheep, it reached the small intestine in too weak a concentration to be in any way effective against the worms situated there or lower down in the gut.

The process of swallowing in sheep is governed by a groove which passes from the gullet along the roof of the first and second stomachs and eventually into the fourth stomach, which then leads directly into the small intestine. When the sheep grazes the food is passed directly into the paunch, to be later brought back into the mouth, chewed as a cud, and then swallowed again. This time, however, the groove closes and the thoroughly masticated food goes direct to the third stomach or bible and then is passed on with little delay into the fourth stomach. When the sheep drinks the groove is again closed and the water passes almost directly into the fourth stomach. It was therefore considered that if some way could be found of getting this groove to close during treatment the drug would pass directly into the fourth stomach and would reach the worms in the small intestine and large bowel in a sufficiently high concentration to kill most of them.

After a large number of experiments copper sulphate was found to produce this effect. Various strengths from 1 per cent. to 10 per cent. were tried, and it was found that a very small quantity of a 5-10 per cent. solution gave very consistent results. This work was carried out simultaneously in Australia and South Africa. For the small hair worms nicotine sulphate was then combined with the copper sulphate, with very excellent results. This drench was found to be effective against both stomach worms and tape worms. Another point which was brought out by this was that starvation before drenching was not desirable. It was previously considered that, by a starvation period prior to drenching, the locality in which the worms were present would be rendered free of ingested food and better contact of the drug with the worms would be given. It subsequently was found that this was more likely to be achieved without starvation, for with starvation the animals brought up the food from the first stomach, ruminated it, and then swallowed it, thus surrounding the worms in the third and fourth stomachs and in the small intestine with the ingested material. Details of this treatment may be obtained on application to the Animal Health Station.

In South Africa work along these lines has been continued against the nodule worm. It was found that by first placing in the mouth 2½ c.c. of a 10 per cent. copper sulphate solution the groove closed, and then by giving immediately afterwards a powder of copper tratrate, copper arsenate, and calcium hydroxide, a high efficiency against the nodule worm could be secured by two treatments on successive days. This treatment is now being tested in Australia, and is not yet available to the grazier.

—*Dr. F. H. S. Roberts.*

OUR BABIES.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

BABY'S BATH.

THE hour at which baby is bathed will vary with the requirements of different households. Some mothers may find it convenient to bath baby just before his second feeding time (say, between 9 and 10 o'clock in the morning). Whatever the hour chosen, it must be adhered to, so as not to upset the rhythm of baby's day. Of course, baby must never be bathed unless an hour (preferably more) has elapsed since his last feed.

Before starting to undress baby every precaution should be taken, in cold weather, to prevent loss of heat before, during, and after the bath. Undress, bath, and dress quickly, with no delay or dawdling and no unnecessary exposure of the skin. Choose a cosy corner or a warmed room, using a screen if necessary to protect baby from draughts. Prepare everything before lifting baby from his cot. Have dry, warm towels, washers, baby clothing, and all other requirements ready to hand.

When filling the bath always pour in the cold water first, lest the baby, if old enough, or his little brother or sister tumble in, and is badly or even fatally scalded. Then add sufficient hot water to make it comfortably warm, testing it carefully by putting your elbow, not your hand, into it just before putting the baby in.

It is not generally known that when the strong, healthy baby is a few months old he enjoys and derives benefit from being gradually accustomed to having tepid and, later, cool water squeezed over him before being removed from the bath. Let this be followed by a good brisk rub down. Great care should be taken in cleansing and drying eyes, ears, lips, and folds of the skin. For this a gentle dabbing motion is best, and on no account should the mouth be wiped out. Nature provides natural juices in the mouth for perfect cleanliness. Any mild, superfatted soap may be used, but *use sparingly*. If used on the head great care must be taken to see that it is thoroughly rinsed off again, as any trace left is apt to cause dandruff and cradle-cap. Do not be afraid to dry the scalp thoroughly. Firm rubbing will not injure the baby through the soft spot.

Have two washers made from soft towelling or cellular cotton—one for his body, the other for his face. If preferred the face washer may be made from two or three folds of butter muslin. The washers must be boiled frequently. Do not use a sponge; it is hard to keep clean, and is liable to become foul and slimy and infested with microbes. Provide two towels also—a face towel and a body towel. The former should be made of soft absorbent material, such as butter muslin, and the latter of ordinary Turkish towelling, preferably linen. As a general rule powder is not needed. The baby should be dried so thoroughly that powder is quite unnecessary. If used carelessly, the powder tends to cake in the folds of the skin and to cause irritation and subsequent rawness. The folds of the skin should be dried with a towel, not with powder.

General Rules for Bathing.

1. Bath in a cosy corner of the room, using a screen if necessary to protect baby from draught.
2. Have everything in readiness before lifting baby from his cot.
3. Bath baby quickly. Remember, bathtime is not playtime.
4. Do not take baby out of a heated room before first wrapping him cosily in a shawl or blanket.

IN THE FARM KITCHEN.

SOME POTATO DISHES.

If, when boiling potatoes, you have them entirely covered with water, they will not turn black.

When baked potatoes are wanted, and there is little time to cook them, boil for fifteen minutes before baking. When roasted potatoes are wanted quickly, boil quickly for two minutes, drain well, steam till dry, then place with fat in a roasting tin under the roast. Turn them in the fat, so that they are greasy all over, before roasting.

Potato Chips.

Peel and wash the potatoes. Dry well. Cut in lengths of equal thickness moderately so to serve with grills or into strips like matches for cocktail chips, or trim the potato at each end, then cut into rounds the size of a crown-piece, or slice them very thinly to make crisps. No matter which way you cut them, make the frying fat hot, but it must on no account boil. Put a few potatoes in the frying basket. Plunge the basket into the fat. Cook the potatoes over a moderate heat till tender and slightly coloured. Remove the basket at once. Place the potatoes on a sieve to get partly cold. Replace the fat on the fire, and when it steams a blue vapour plunge the potatoes in a second time. Shake them about in the basket till they are swollen and crisp. Remove at once. When frying these do not put too many in the frying basket at once.

Lyonnaise Potatoes.

Take 1 pint cold boiled potatoes, ½ teaspoonful salt, 1½ tablespoonfuls chopped parsley, 1 teaspoonful chopped onion, 2 tablespoonfuls dripping, pepper to taste.

Slice the potatoes. Season with pepper and salt. Fry the onion in dripping until light brown. Add the potato and cook till all the fat is absorbed. Add the chopped parsley and serve with any cold meat.

Potato Dumplings.

Take 6 potatoes, 2 eggs, ½ cupful margarine, ¼ teaspoonful crushed herbs, 1½ teaspoonfuls salt, ½ cupful flour, ½ teaspoonful minced parsley.

Boil the potatoes, choosing medium-sized ones. Drain when ready. Steam to dry them, and mash when cold. Stir in the eggs, salt, flour, and seasoning. Mix and knead well till smooth. Shape into one long thick roll. Cut into half-inch pieces. Roll into dumplings the size of your finger. Cook in soup or boiling salted water for ten minutes. Drain in a colander. Place in a hot serving dish. Pour melted butter, cooked till brown, over the dumplings when served. If cooked in soup, serve the dumplings in the tureen with the soup.

Potato Croquettes.

Take 3 cupfuls hot mashed potato, 1 teaspoonful salt, 1 egg, pinch pepper, 2 tablespoonfuls butter or margarine, 1 teaspoonful minced parsley, 1 teaspoonful minced onion (this may be omitted), flour.

Put the potatoes, butter, salt, pepper, parsley, and onion into a basin, and mix well together with a wooden spoon. Cool. Shape into balls or potato shape. Roll in flour. Dip in lightly-beaten egg and coat with breadcrumbs. Fry in deep, smoking hot fat for three minutes. Drain and serve.

Stuffed Potatoes.

Take 6 baked potatoes, ¾ cupful grated cheese, 1 teaspoonful salt, ½ cupful hot milk, 2 tablespoonfuls margarine (or butter).

Use large potatoes of good shape. When potatoes are soft, halve lengthwise. Scoop the inside into a saucepan. Mash. Mix with margarine, salt, milk, and pepper to taste. Return to the shells. Sprinkle with cheese. Place dabs of margarine on top. Bake in a baking tin in a moderate oven for five to ten minutes till crisp and brown on top.

Devilled Potatoes.

Take 18 new potatoes, 1½ tablespoonfuls butter, 1 egg-yolk, ¾ teaspoonful mixed mustard, 1½ teaspoonfuls vinegar, lard for frying, salt and pepper.

Boil potatoes, but not long enough to break. Drain, and melt lard to fry them in. When hot, drop in the potatoes. Fry five minutes, lift out, drain quickly, and turn into a saucepan containing the melted butter mixed with the mustard. Sprinkle vinegar over, season, and cook for three minutes, shaking constantly. Remove from the heat and strain off liquor. Stir in the beaten egg-yolk, add potatoes, heat well, and serve at once.

Baked Potato Mash.

Take 2 cupfuls cold mashed potatoes, 2 tablespoonfuls melted margarine, 1 egg, 1 cupful milk, pepper and salt.

Beat the margarine well into the potatoes. Stir in the well-beaten egg-yolk, milk, and lastly the stiffly frothed egg-white. Season to taste with salt and pepper. Bake in greased fireproof dish in a quick oven. Serve immediately.

Scalloped Potatoes.

Take 2 lb. potatoes, 3 to 4 oz. cheese, 1½ oz. butter, 2½ gills milk, salt and pepper, 1½ oz. flour.

Peel the potatoes, wash them and cut into thin slices. Put them into a buttered pie-dish in layers, sprinkling each layer with flour, pepper, salt, finely-grated cheese, and dabs of butter. Pour in the milk, sprinkle cheese on top, cover dish with a buttered paper, and bake the potatoes in a moderately hot oven for about one hour and a-half, until the potatoes are tender.

Duchesse Potatoes.

Take 1 lb. potatoes, 1 oz. butter, 1 egg, 2 tablespoonfuls milk, 1 oz. flour, salt and pepper.

Wash, peel, and boil the potatoes and drain them. Add the butter and milk and mash the potatoes with a fork. Beat the egg and mix nearly all of it with the potatoes. Season with salt and pepper. Turn potatoes on to a floured board and shake into five or six squares. Put in a flat baking tin and brush the tops with the remainder of the egg. Bake in a quick oven for ten to fifteen minutes.

Cream of Potatoes.

Take 2 lb. potatoes, 1 oz. butter, ½ pint milk, 1½ quarts water, 3 large onions, 1 teaspoonful minced parsley, salt and pepper.

Peel and slice the potatoes into a saucepan. Add the peel and sliced onions, water, and pepper and salt to taste. Cover and simmer two hours. Rub through a sieve and return to the saucepan. Add butter. Bring to the boil and whisk in boiling milk with an egg-beater. Add parsley and serve at once.

Hungarian Potatoes.

Take 3 cupfuls diced potatoes, 1 egg-yolk, 3 tablespoonfuls beef dripping, 2 tablespoonfuls flour, 1 teaspoonful minced onion, 1 cupful hot milk, 1 teaspoonful chopped parsley, 2 tablespoonfuls butter, salt, pepper, and paprika to taste.

Wash and peel potatoes before cutting them into cubes one-third of an inch square. Place in a saucepan. Cover with water, bring to the boil, and boil three minutes. Then drain well, melt dripping in frying pan, add potatoes, and cook on a low flame until potatoes are soft and lightly brown. Melt butter in a saucepan, add onion, cook for half a minute, then stir in flour and hot milk. Season to taste with salt, pepper, and paprika, then stir in egg-yolk. Pour sauce over potatoes and sprinkle with parsley.

Angus Potato Soup.

Take 1 lb. roast beef bones, 2 quarts water, 1 large carrot, 2 large tomatoes, 10 potatoes, 2 medium onions, seasoning.

Place the bones in a saucepan. Add water. Cover and simmer for one hour. Uncover and add the peeled and chopped onions, and potatoes, minced carrot, and scalded and peeled tomato. Simmer slowly for one and a half hours. Season to taste and serve very hot.

◆

IN A WESTERN GARDEN.

Mr. Hughes's garden at Nockatunga shows a fruit production easy to all this western country. Soil is right. Sun heat is right. And when to these are added irrigation California and Mildura and Leeton have never bettered it. In 1910 I first saw New Mexico, and its soil was generally so poor that I doubt if there is much in Australia to compare with it. I passed through again in 1921, and in the eleven years intervening irrigation had made the desert a garden.

At Nockatunga, on water and white sand, grow grapes, oranges, persimmons, melons, cauliflower, and root crops to perfection. An all-steel waggon—for in this dry air waggons of wood fall to pieces—drawn by six camels and loaded with goat manure, carries the fertilizer to the crop. The Chinese gardeners will not use cow manure, and their selection of fertilizers is backed by results. Citrus fruits--almost equalling the oranges and grape fruit that were a feature of the 1937 show at Charleville—grow in plenty, the trees so heavily laden that some of the bearing branches trail upon the earth.

Nockatunga, a homestead of pisé, cool and wire-screened, is a sample of the station houses built when the old-time pastoralist had got over the hard work of the run, and could find time to make comfort for himself. Most of these more comfortable houses were built in the time of sheep. The work among cattle is more crude, and, generally, the cattleman's homestead reflects his work.

The sheepman is more settled. In growing the finer Australian wools he knows that the product will almost never know a glutted market. The homes of grazing selectors around the Quilpie district are modern houses, wire-screened, and some electrically lighted and refrigerated. They are an insurance of permanence in the settlement of this far-western region.

Nappamerrie, Nockatunga, and the beautiful palms, lawns, and gardens of Mount Margaret stay in the memory.—Randolph Bedford in "On the Western Edge."

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON

Divisions and stations.	AVERAGE RAINFALL.		TOTAL RAINFALL	
	July.	No. of years' records.	July, 1937.	July, 1936
North Coast	In.		In.	In.
Atherton	1·03	36	3·44	2 07
Cairns . .	1·54	55	3·66	1·74
Cardwell .. .	1·35	65	2·08	1·28
Cooktown ..	0·96	61	1·12	1·45
Herberton .	0·85	51	1·66	1·16
Ingham	1·61	45	2·75	1 19
Innisfail .. .	4·64	56	10·62	7·18
Mossman Mill .	1·25	24	2·71	1·20
Townsville	0 61	66	0·62	0 27
Central Coast				
Ayr	0·68	50	0 37	..
Bowen .. .	0·93	66	0·47	..
Charters Towers ..	0·64	55	0·43	0·30
Mackay .. .	1·68	66	0 90	0 55
Prosperine ..	1·55	34	1·25	1 36
St. Lawrence .	1·39	66	0·51	0 23
South Coast				
Biggenden ..	1·38	38	0·90	0 34
Bundaberg .	1·84	54	1·60	0 75
Brisbane	2·23	85	1·15	1·31
Caboolture ..	2·18	50	0·73	1·28
Childers	1·69	42	2·08	0·54
Crohamhurst .	2·98	44	1·42	1·80
Esk .. .	1·98	50	0·65	1 56
Gayndah ..	1·46	66	1·45	0·46
Gympie	2·11	67	0 96	1·17
Kilkivan	1·60	58	0·69	0·45
Maryborough ..	1·91	66	2 54	1·48
Nambour	2·69	41	2·12	1·12
Nanango .. .	1·66	55	0·95	1·24
Rockhampton .	1·77	66	1 89	0 40
Woodford .. .	2·37	50	0·61	1·57
Central Highlands	In.		In.	In.
Clermont	1 04	66	0·80	0·73
Gindie ..	1·13	38		0·71
Springsure	1 23	68	0 43	1·80
Darling Downs				
Dalby ..	1·74	67	0·97	2·00
Emu Vale	1·61	41	0·88	2·59
Hermitage ..	1·75	31	0 74	1·48
Jimbour	1·54	49	0·86	2·05
Miles .. .	1·66	52	0·86	2·50
Stanthorpe	2 05	64	0·90	2 87
Toowoomba	2·11	65	1·08	2·40
Warwick .	1·86	72	0·82	2·50
Maranoa				
Roma .. .	1 48	63	0 60	1 69
State Farms, &c				
Bungeworgorai ..	1 43	22	..	1·20
Gatton College ..	1·42	38	0·98	1·47
Kairi	1·11	21	..	..
Mackay Sugar Experiment Station	1·50	40	0·50	0·45

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure. at 9 a.m.	SHADE TEMPERATURE.						RAINFALL.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points	
Cooktown	29·99	74	65	81	21	61	10, 12	112	7
Herberton	.	66	53	77	1	42	6, 7	166	13
Rockhampton	30·20	72	53	80	23	40	6	189	7
Brisbane	30 27	68	50	77	23	42	2, 3	115	13
Darling Downs.									
Dalby	30·28	67	38	74	18	28	4	97	3
Stanthorpe	..	55	32	66	20	18	4	90	6
Toowoomba	..	63	42	71	18	32	6, 26	108	4
Mid-Interior.									
Georgetown	30·05	80	56	86	23, 31	41	25	Nil	..
Longreach	30·20	73	45	80	19, 21	34	5, 6	38	3
Mitchell	30·29	65	35	74	21	25	4, 5	88	3
Western									
Burketown	30·06	81	56	88	22	45	6	Nil	..
Boulia	30·21	73	46	83	31	37	6	Nil	..
Thargomindah	30·27	66	40	78	31	32	5, 25	Nil	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	September. 1937.		October. 1937.		MOONRISE. Sept. 1937.	MOONRISE. Oct. 1937.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a m	a.m.
1	6·7	5 37	5·33	5 51	2·56	3·4
2	6 6	5·37	5·32	5·51	3·45	3·43
3	6·5	5 38	5·31	5·52	4 27	4·18
4	6·4	5·38	5·29	5·53	5·6	4·53
5	6·3	5·39	5·28	5·53	5 43	5·28
6	6·2	5 39	5·27	5·54	6 19	6·5
7	6 1	5 40	5·26	5 54	6·54	6·43
8	5·58	5 40	5·25	5·55	7·29	7·24
9	5 57	5 41	5·24	5 55	8·6	8·6
10	5·56	5 41	5·23	5·56	8·46	8·52
11	5 55	5·42	5·22	5·56	9·26	9·42
12	5·53	5 42	5·21	5·57	10·10	10·34
13	5 52	5·43	5·20	5·57	10·59	11·29
						p.m.
14	5 51	5·43	5·19	5·58	11 51	12·25
					p.m.	
15	5 50	5·44	5·18	5·58	12 46	1·20
16	5 49	5·44	5 17	5·59	1·40	2·17
17	5·48	5·45	5·16	6·59	2·37	3·17
18	5·47	5·45	5·15	6·0	3·36	4·18
19	5 45	5·45	5·14	6 1	4 35	5·21
20	5 44	5·46	5·12	6 1	5 34	6·29
21	5·43	5 46	5·11	6·2	6·36	7·37
22	5 42	5·47	5 10	6·3	7·36	8·33
23	5 41	5·47	5·9	6·3	8 48	9·46
24	5 40	5·47	5·8	6·4	9.54	10·46
25	5·39	5·48	5·8	6 5	10·56	11·37
26	5·38	5·48	5·7	6·5	11·58	a.m.
27	5·37	5·49	5·6	6 6	..	12·23
					a.m.	
28	5 36	5·49	5 6	6·7	12·52	1·6
29	5 35	5·50	5·5	6·7	1·40	1·44
30	5·34	5·50	5·4	6·8	2 24	2 19
31			5·3	6·9		2·53

Phases of the Moon, Occultations, &c.

5th	Sept.	●	New Moon	8 54 a.m.
13th	,,	☽	First Quarter	6 57 a.m.
20th	,,	○	Full Moon	9 32 p.m.
27th	,,	☾	Last Quarter	3 43 p.m.

Apogee, 12th September, at 8 a.m.
Perigee, 24th September, at 7 a.m.

An interesting phenomenon will occur in the early morning of the 24th, when Venus, in Leo, rising at 3.55 a.m., will be separated by only about a fourth of a degree from Regulus, the first magnitude star on the ecliptic. An intefested observer may see them until all but the brightest stars are lost in the approaching daylight.

On the 25th Saturn will be in opposition to the Sun, rising as the Sun sets. It will then be very near the position in Pisces where the Sun crosses the celestial equator on the 21st March. Northward and a little to the east of Saturn are the two stars which mark the eastern side of the Great Square of Pegasus.

On the 30th Mercury will arrive at its greatest distance, 18 degrees west of the Sun. Rising at 4.24 a.m., the swiftest planet will be near the invisible and most tardy of all planets, Neptune, on the outskirts of the solar system, taking 164 years to complete a circuit around the Sun, whereas Mercury, nearest the Sun, runs through all the twelve Zodiacal constellations in 87 days.

Mercury rises at 6.54 a.m., 47 minutes after the Sun, and sets at 7.16 p.m , 1 hour 39 minutes after it, on the 1st , on the 15th it rises at 5.35 a m., 15 minutes before the Sun, and sets at 5.39 p.m., 5 minutes before it.

Venus rises at 4.5 a.m., 2 hours 2 minutes before the Sun, and sets at 2.47 p m., 2 hours 50 minutes before it, on the 1st , on the 15th it rises at 4.8 a m., 1 hour 42 minutes before the Sun, and sets at 3.8 p.m., 2 hours 36 minutes before it.

Mars rises at 10 53 a m. on the 1st and sets at 12.51 a.m. on the 2nd ; on the 15th it rises at 10.31 a.m and sets at 12 35 a.m on the 16th.

Jupiter rises at 1.36 p.m. on the 1st, and sets at 3.34 a.m. on the 2nd ; on the 15th it rises at 12.38 p.m. and sets at 2.28 a.m. on the 16th.

Saturn rises at 7.26 p m on the 1st and sets at 7.34 a.m. on the 2nd ; on the 15th it rises at 6.23 p.m. and sets at 6.37 a m. on the 16th.

The Southern Cross will be at its lowest position about 2 a.m., and therefore disappear at Warwick about midnight at the beginning of the month and 2 hours earlier at the end.

4th	Oct.	●	New Moon	9 58 p.m.
13th	,,	☽	First Quarter	1 47 a.m.
20th	,,	○	Full Moon	7 48 a.m.
26th	,,	☾	Last Quarter	11 26 a.m.

Apogee, 10th October, at 4 a.m.
Perigee, 22nd October, at 2 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate; as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

Prospects of the Coastal Cattle-fattening Scheme.

FAVOURABLE reports of the cattle-fattening scheme on coastal country in the far North, which was inaugurated by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, in co-operation with Mr. Brice Henry, of Tully, continue to come to hand. Other graziers have since become interested in the scheme, towards the success of which considerable progress has been made. Of the meat exported from the Commonwealth to the United Kingdom in 1936-37, Queensland contributed 45.58 per cent. of the total. The coastal fattening scheme, therefore, promises to have considerable influence on the further development of the chilled beef export industry.

Chilled Beef Export.

IN the annual report of the Queensland Meat Industry Board, it is stated that the shipment of chilled beef from the Dominions is the most interesting development in the world's meat trade since the introduction of mechanical refrigeration. Exports from Empire countries were confined formerly to frozen and canned beef. "This limitation largely was responsible for the relatively small inducement offered for the improvement of beef cattle herds and cattle properties." The report goes on to state that Empire countries in a relatively short time have made substantial progress in the shipment of chilled beef. The number of quarters shipped from Australia exceeds greatly that from any of the other countries indicated, and there is yet the opportunity for a considerable expansion of the trade from this country. For the year 1936-37, Australian chilled exports represented about 23 per cent. of its total quarters shipped. "Towards the end of 1933 experimental work had progressed sufficiently to enable the investigators broadly to indicate the conditions to be maintained in each phase of the works treatment and overseas transport, to permit of chilled beef being placed in good condition on the markets of Great Britain. In particular, the investigations had shown that, even with a period of storage equivalent to a relatively short voyage of forty-five days from Queensland to Great Britain, extremely strict attention to cleanliness and certain alterations in existing technique in the meatworks, as well as the use in the ships' holds of atmospheres containing 10 per cent. carbon dioxide, were essential to commercial success. . . . The number of chilled quarters prepared at the Brisbane Abattoir for export to England has exceeded 160,000, and, from the standpoint of absence of microbial spoilage, highly satisfactory results have been obtained."

Technical Difficulties Almost Overcome.

ANOTHER important statement of the Queensland Meat Industry Board in its annual report is that technical difficulties in the preparation of chilled beef and of its transport from Australia to the United Kingdom may now be regarded as almost overcome. "Much, however, remains to be done in the regularity of overseas transport and in production before the trade can be said to have become reorganised on a thoroughly sound commercial basis."

The necessity for all Australian works engaged in the preparation of chilled beef for export overseas to observe fully the conditions of the Council for Scientific and Industrial Research cannot be emphasised too strongly, nor can the procedure be successful without the full interest and co-operation of the men employed on the slaughter-floor and elsewhere in the preparation.

"In varying circumstances, particularly in protracted voyages," continues the report, "it has been found that there can be a marked loss of 'bloom,' or, in other words, an absence of the natural brightness of the beef. The factors influencing the rate of loss of bloom appear to include the initial quality of the animal, the treatment to which it is subjected shortly before slaughter, the rates of loss of weight of the beef during each stage of treatment from slaughter to marketing, and the method of carriage, including stowage on shipboard."

These factors are now the subject of detailed study by the Council for Scientific and Industrial Research. It is likely that the results of certain aspects of these studies will shortly be made available.

The factor of ample resting at the works prior to slaughter merits the closest attention. A series of tests carried out by the Board indicates that this practice is of value in the elimination of "fieryness"—a condition which depreciates seriously the value of Australian chilled beef on English markets. It is essential that all parties concerned in the transfer of cattle from the properties to the meatworks should work with the knowledge that the real value of the animal is determined by the soundness of the carcase when the hide is removed.

Dealing with transport, the Board states that the provision of an adequate and regular shipping service must be regarded as essential during progress in the production stage. This service is necessary to give encouragement and stability to cattle producers. It is inevitable that the transport features of a new trade of such an exacting kind can be handled only by experience and co-operation. The Australian Meat Board, working in conjunction with the Overseas Shipping Representatives' Association, has this matter under consideration with the object of effecting a marked improvement in the coming year.

The marketing of beef cattle in Queensland is largely seasonal. In the export of chilled beef the bulk of supplies is available to the United Kingdom in its summer months, the rate of beef consumption being usually then at its minimum. On the other hand, supplies from Queensland tend to fall off very seriously when the demand in English markets is at its best.

"Further improvement in the status of the beef cattle industry will in the main now depend upon improvements within the production stage, particularly in the spreading of the marketing period more evenly over the year," the Board declares. "Progress, no doubt, will be slow in this stage of the business. Better subdivision and watering of cattle properties in the more favourable regions of the State, together with an intensive investigation of pasture improvement and pasture management, should help materially to fulfil the remaining outstanding requirement in the thorough organisation of the chilled beef trade—an extension of the marketing period of well-finished and well-bred young steers."

The Bush Fire Risk—An Appeal.

FARMERS whose properties are adjacent, even remotely, to State forests who plan to burn off grass lands are advised that the Forestry Department is willing to co-operate with them in the strict control of fires lit for that purpose. A co-operative marshalling of the available man power in the neighbourhood has been planned for keeping fires within proper bounds. A general appeal to the people to exercise the greatest care possible to prevent the accidental starting of fires is considered necessary by officers of the Forest Service. The slightest laxity in the throwing-down of glowing matches on roadsides or in the covering-up of camp fires might result in disaster to country homes, crops, and forests. Severe penalties have been prescribed for the careless use of fire, and forest officers must be notified of any intention to burn off pastures or scrub on land within the vicinity of State forests.

Every summer heavy losses occur in country districts as a result of bush and grass fires. It is hard sometimes to prevent such losses, but by far the greater proportion can be avoided if timely precautions are taken. It is possible, for instance, to organise a bush fire brigade and prepare plans for quenching quickly any outbreak. With the hot weather approaching—especially after the dry spring we are having—the formation of such a voluntary corps of fire fighters is worth the consideration of every local producers' association.

The value of bush fire brigades has been proved amply in other States, and by their well-organised action potentially very serious bush fires have been prevented from devastating a whole countryside.

Banana Rust Thrips Control.

N. E. H. CALDWELL, B.Sc.Agr., Assistant Research Officer.

THE banana rust thrips* has been recognised for a long time as a pest affecting cultivated bananas in Queensland. In the last two decades, however, it has become of increasing importance. During this period there has been very considerable development in the banana growing industry in the southern portions of the State, and certain districts from time to time have been subjected to severe infestations of the pest. In the North the banana rust thrips regularly attains serious proportions; but, owing to the slight development of the industry there, particularly as regards fruit for export to southern States, the losses are much less important than in the South.

Distribution in the State.

There now are practically no major divisions of the banana growing areas of the State in which the banana rust thrips is not known to occur. Nevertheless, plantations in many isolated localities, particularly south of Gympie, still continue to produce rust-free fruit, and in some others, the pest population has been insufficient to cause commercial damage to the fruit. Though the insect appears to be spreading gradually throughout the banana-growing areas of Southern Queensland, there is no doubt that the embargo on transferring planting material from infested plantations to clean areas has been, and will continue to be, a very important check on the spread of the pest.

Present Status of the Pest in Southern Queensland.

Following very serious losses in several districts, notably Gympie, Cooran, Pomona, Beenleigh, and Nerang, in 1931-33, the importance of the pest has gradually declined until in the 1936-37 summer there were very few plantations which suffered appreciable financial loss. This has been due partly to a decreased density of the thrips population, with proportionately less severe rust development, and partly to a marked coincidental reduction in the acreage under bananas in the more important infested districts. The history of the pest in Southern Queensland shows that fluctuations between severe epidemic incidence and comparative insignificance must be expected in normal times. Unfortunately, it is not possible to predict the probable rust incidence in any season; but it seems not unreasonable to suppose that the next few seasons may witness another severe outbreak.

Nature of the Injury.

Rust is the common name given to the red or reddish brown discolouration of the skin of the banana fruit (Plate 163) caused by the feeding of both adult and larval banana thrips. This discolouration may be confined to a small area near the points of contact of adjacent fingers, or it may cover the greater part of the surface of each fruit. Usually rust is accompanied to a greater or lesser extent, by surface cracking of the skin. When injury is very severe the rind may split, exposing the flesh of the fruit. The most acute form of rust is due to insect activity during the early stages of bunch development, and it is in association with injury incurred at this time that severe cracking and splitting are most prominent. However, appreciable commercial rust can be caused by insect attacks during the later stages of fruit growth, but, in such cases, anything more than superficial cracking in addition to the discolouration, is rather unusual.

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* *Scirtothrips signipennis* Bagn.

Plate 163.
Injury caused by the Banana Rust Thrips.

Rust of any degree detracts from the appearance of the fruit, though moderate blemishes do not impair its edibility. Severe rust, even without splitting, however, may spoil the flavour, while split fruit has no market value at all. As fruit is bought and sold largely on its appearance, rust blemishes must be kept at an absolute minimum if the grower wishes to avoid the penalties imposed by the trade on "rusty" fruit.

Description of the Insect and Its Life History.

The adult is a slender insect, rather less than one-sixteenth of an inch long, the female being slightly larger than the male. It is golden-yellow in colour with two dark spots on the back towards the anterior end of the body, and a longitudinal dark line down the centre of the back of the posterior half. These dark markings are due to shaded areas on the two pairs of delicate fringed wings, which normally are folded across the back.

The larva is white to yellowish in colour. When first hatched it is approximately one-twenty-fifth of an inch in length, but the mature larva is nearly as long as the adult, and proportionately slightly broader.

The very small egg is laid by the female just beneath the surface of the plant tissue, usually either on the fruit or on the pseudostem in sheltered places beneath the edges of leaf sheaths.

Larvæ and adults may be found on any part of the pseudostem beneath the edges of the leaf sheaths, in the throat of the plant—particularly in and round the funnel leaf—and on the fruit. The larvæ, on becoming mature, enter the soil in which the pupal, or resting stage, is passed. On emerging from the milk-white pupæ, which approximately are the same size as the mature larvæ, the adults make their way back to the plant. Adults are capable of weak flight.

During the warmer months of the year eggs hatch in from seven to ten days, while the larval and pupal stages each last from seven to ten days. Adults may live many weeks. In the colder months the developmental stages are prolonged greatly.

The pest is most abundant during the summer, the peak population being reached between January and April, and the lowest level in July and August.

Insects Liable to be Confused With the Banana Rust Thrips.

There are several other species of small insects commonly found on banana plants, which growers tend to confuse with the banana rust thrips. Another species of thrips* is very like the banana rust thrips, and appears to cause a similar type of injury to banana fruit. It is, however, relatively very scarce; and, moreover, is not known to occur other than in association with the pest species.

Still another species of thrips† is the main cause of confusion to growers. It is found on almost all banana plantations on the "flower" ends of the bunches, frequently in enormous numbers. The male is a pale yellow insect slightly smaller than the banana rust thrips, and does not possess the dark markings of the latter species. It also is noticeably more active. The female is much larger and conspicuously black and red in colour.

The banana silvering thrips‡ is troublesome sometimes in various plantations where the banana rust thrips is known to occur. The injury, however, is quite distinctive, the fruit acquiring a silvery sheen on the exposed surface. Except in a few plantations, this insect is of no great economic importance. As normally it attacks the fruit in spring, both the appearance of the fruit and the time of the year in which the pest is abundant, are excellent diagnostic characters.

No other insects commonly found in banana plantations bear any resemblance to the banana rust thrips, and should not be confused with the pest species.

---

* *Physothrips bilongilineatus* Gir.

† *Thrips florum* Schmutz.

‡ *Hercinothrips bicinctus* Bagn.

Selection of Planting Material.

If possible growers should obtain their planting material from plantations where rust is unknown or, failing this, from an area where it is only slight. At all costs heavily-infested plantations should be avoided as a source of supply. Precautions in selecting planting material may obviate or, at least, tend to delay the establishment of the pest in newly-planted areas.

Growers should realise that rust-free does not necessarily mean thrips-free. A small insect population confined to the lower parts of the plants may escape detection even under close examination. Transported to a new plantation and under different seasonal conditions, these insects may be quite sufficient to initiate a severe outbreak of the pest.

Treatment of Planting Material.

Suckers taken from a heavily-infested plantation and pared, and trimmed in an average manner as for banana weevil borer control, are not freed of thrips by treatment in a nicotine sulphate bath (one part of nicotine sulphate to 500 parts of water). The dipping of heavily pared and trimmed suckers may give satisfactory results, but the feasibility of such treatment in practice still requires checking. Nevertheless, paring and trimming, compatible with the commonly accepted standards of safety, do reduce the thrips population on the suckers, and are recommended for this pest as for the banana weevil borer.

For various reasons the use of "bits" as planting material is practised sometimes by banana growers. Theoretically planting material of this type obtained from a thrips-infested plantation is unlikely to harbour these insects. "Bits," therefore, may be of value in establishing new plantations, when the risks of transferring thrips along with the planting material must be minimised, but there is no precise evidence on the point as yet.

Control on Bearing Plantations.

Recent experimental work has shown that the bagging and dusting of the bunch provide a satisfactory economic method of rust control.

The bag must be made of good quality "sugar" hessian, i.e., 11 oz. hessian. Bags 45 inches deep by 27 inches wide are large enough to accommodate normal bunches.

Nicotine dusts give the best results. The nicotine may be present in the dust either as free nicotine or nicotine sulphate, but the actual content of nicotine should be not less than 2 per cent. The physical properties of the dust are most important. A light "fluffy" kind of dust is necessary to secure adequate penetration into all parts of the bunch. Heavy, quick-settling dusts do not give this result. For this reason nicotine dusts, in which some other insecticidal materials such as sulphur have been incorporated, are usually unsatisfactory for the control of the banana rust thrips.

The bunch must be bagged as soon as practicable after emergence from the throat of the plant. The mouth of the bag should be fastened securely round the bunch stalk above the top hand by means of string, wire, or a nail. About a fortnight later the bag should be taken off, fallen bracts emptied out, persistent bracts removed from the bunch, the "bell" broken off, and the bag then replaced. This operation is necessary to minimise the risk of fungal infection of the fruit.

During the thrips-active season, the dust must be applied to the bagged bunches at fortnightly intervals throughout the life of the bunch, or as an alternative, at weekly intervals for a month after the bunch is thrown, dusting then being discontinued. The former method has given satisfactory results under all conditions experienced in Southern Queensland in the last four seasons. The second has been tried for only one season under conditions of moderate rust incidence, when it was completely satisfactory, and this treatment may, for all practical purposes, prove to be as efficacious as the first.

The first dusting is applied either before or just after the bag is first fitted to the bunch. In the former case both the bunch and the bunch stalk above the top hand can be dusted thoroughly. Quite good results, however, can be obtained by applying the initial dusting through a small hole in the bottom of the bag. All subsequent dustings are given through this aperture. When dusting in this manner, care should be taken to ensure that, by pointing the mouth of the duster more or less directly upwards, the dust is blown right through the bunch from bottom to top.

In all readily available makes of dust gun it is necessary to reduce very considerably the flow from the machine. Without some modification, dusters are liable to discharge excessive amounts of the insecticide which tend to accumulate on the fruit. This may necessitate cleaning before packing.

With small hand dusters of the plunger pump type holding about one-half pound of dust, the aperture of the hopper outlet is usually three-eighth inches in diameter. The dust flow of these machines can be reduced effectively by inserting into the outlet a cork from which a V-shaped section has been cut so that the area of the aperture is one-eighth that originally provided. About six full strokes of the pump are then sufficient for an average bunch. The ideal to be aimed at is to envelop the bunch within the bag in a cloud of dust without depositing more than a film of dust on the fruit. With care and a little practice growers should have no difficulty in performing this operation in a satisfactory manner.

Two other methods of treatment give a fair measure of control. Though not so efficient in the control of rust as bagging with dusting, they have the merit of much smaller cost, and thus may be useful, under certain conditions. For instance, they might well be worth considering early in the season until the trend of thrips activity becomes quite clear.

In the first of these alternative methods, the bags are dispensed with and the bunch is dusted with a nicotine dust at weekly intervals. Longer intervals between dustings are much less efficient. Treatment must be thorough. The dust must be blown into the bunch from all angles, particular attention being paid to the top hands, where thrips infestation is heaviest, especially if the bunch is at all choked. At the same time the dust residue must be kept down to a minimum.

The second alternative method requires the use of a cloak and the application of a nicotine dust at fortnightly intervals. The cloak—a piece of hessian—is wrapped round the bunch as soon as possible after

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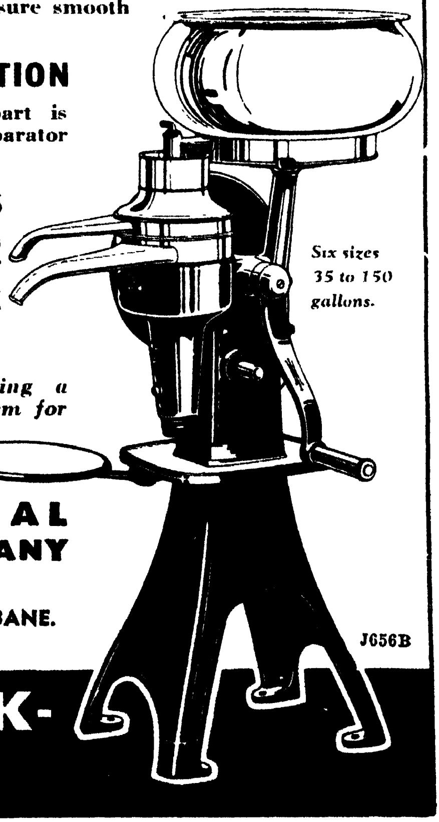

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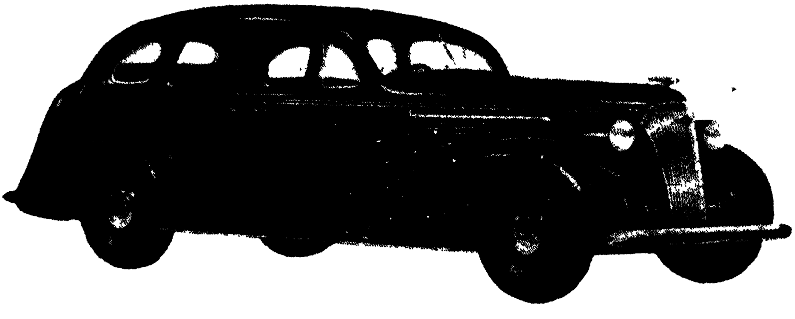

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it is thrown. Thereafter the procedure is the same as with bagging and dusting, the insecticide being blown on to the bunch from the bottom and exposed side, if any. The cloak must be of the same quality hessian as is used for the bags and large enough to envelop the bunch fairly completely.

It is necessary to stress the fact that open mesh, inferior quality hessian, when used either as bags or cloaks, has not proved satisfactory in banana rust thrips experiments.

Whichever control measure is adopted by the grower, every stool in the plantation should be inspected at weekly intervals, or as near thereto as practicable. Thus, even in the case of bagging with fortnightly dustings, the selection of newly-thrown bunches for bagging and dusting should be carried out each week. If this is not done, some bunches will be nearly a fortnight old before the first treatment, by which time they may have developed a certain amount of rust, and what is more serious, acquired a dangerously large thrips population.

Time for Control Measure Application.

The period in which thrips are sufficiently numerous to cause commercial damage to fruit varies considerably from year to year. Normally, growers should be prepared to start control operations during November, but a close watch should be kept on the situation from early October. When bunches less than a month old show appreciable amounts of rust, or are harbouring a large thrips population, control operations should be started immediately. Treatment should not be deferred until "rusty" fruit is being harvested. When control measures are applied first to newly-thrown bunches, those already hanging should not be neglected. November "dumps" (the name describes the characteristic bunches thrown at that time of the year), though they may remain practically clean for some weeks, are very liable to become rusted rather badly by the time they are harvested, and it is not uncommon for October-thrown bunches to be affected similarly.

Dusting may be terminated safely at the end of April, or perhaps a little earlier in some seasons, but the incidental benefits due to bagging the fruit, and to a somewhat lesser extent from cloaking, are so great that growers, where practicable, should continue covering the bunches right through the winter.

The selection of the right time to start control work will depend on the judgment of the grower. Much time and money can be lost by faulty decisions, and growers therefore should familiarise themselves with the appearance and habits of the pest. The insects in the adult and larval stages, the only stages with which the grower need be concerned, are visible readily to the naked eye, while the results of their work are only too obvious. Finally, it cannot be emphasised too strongly that the appearance of the young bunches in the plantation, and not the cut fruit in the shed, is the key to properly applied control measures.

Cultural Points to be Considered in Rust Control.

It is a well-established fact that "choked" bunches develop rust more severely than well-thrown ones. Further, as the fruit in such bunches is compacted and less accessible to dusts, the efficiency of all control measures is reduced appreciably. Correct methods of cultivation, suckering and fertilizing, designed to promote vigorous growth and well-thrown, quickly-maturing bunches, therefore, are desirable.

A certain degree of rust control sometimes can be obtained by regulating the time of bunching, so that the majority of bunches are thrown during spring or autumn, when thrips activity is less than in the summer months. Cultural difficulties play a predominant part in any such programme, and probable market conditions also must be considered. Bunches thrown in spring escape rust to a large extent, but are marketed when prices are relatively low. Hence, when a plantation can be relied upon to throw good autumn bunches suckering practices should be arranged so that the bunches are thrown in the autumn. Under these conditions bunch treatment for rust control will be necessary only for the March and early April bunches. Bunches thrown during the autumn, however, should be bagged, irrespective of rust incidence. This treatment will ensure the development of well-filled, good quality fruit (despite the cold winter conditions) which will be ready for cutting in the spring when the market is normally buoyant.

Practical Difficulties Associated With Control Measures.

The most effective of the control measures discussed—the bagging with dusting method of treatment—introduces certain practical difficulties into plantation operations, which can be overcome by a little organisation of labour and materials on the part of the owner.

Some method of distinguishing bunches bagged each week is necessary, and the bags, therefore, should be marked with a different numeral for each week. The numbers should be placed on both sides of the bag, and should be as large as practicable, to facilitate recognition at a distance. The use of Roman notation would reduce printing difficulties. The ordinary blacking used in stencilling should be quite satisfactory.

Such a method of numbering bags will simplify the identification of those bunches which require dusting in any one week. It also will greatly assist in indicating the age of the bunch. In practice, a knowledge of the exact age of the bunch as shown by the number on the bag, and the feel of the fruit through the bag, is quite sufficient for an experienced grower to judge very accurately the state of maturity of the fruit without removing the cover.

Incidental Benefits of Rust Control Measures.

The bagging of banana bunches (and to a lesser extent cloaking) has several very important incidental advantages which must be considered in appraising the value of the recommended rust control measures.

The general quality of the fruit is improved very appreciably under all conditions. The fruit matures more evenly all over the bunch and also "fills out" satisfactorily in spite of cold weather. Sun scald—very prevalent when the plants have been more or less defoliated by leaf diseases—is eliminuated completely. Cracking of the mature fruit associated with the first cold snap in the autumn is reduced materially. Damage due to incidental pests such as fruit-eating caterpillars, grasshoppers, birds, 'possums, wallabies, and flying foxes, is eliminated almost completely. Black pit, a serious disease of the fruit occasionally occurring in cold situations, is also controlled by bagging. Finally, if the bag is left on the bunch after cutting, the fruit is protected thoroughly on its way to the packing shed.

The colour of bagged fruit is rather pale, but this does not prejudice marketing. There is, therefore, no need to remove the bag for the last week or so before cutting the bunch in an endeavour to deepen the colour, a practice which frequently results in severe scalding.

Cost of Control.

The cost of the various control measures admittedly is rather high. Bagging with dusting is estimated to cost rather less than 6d. per bunch for both labour and materials, assuming that a bag will serve for two bunches. Dusting alone will cost in the vicinity of 2d. per bunch. The cost of cloaking and dusting will depend on the price of the material used for cloaks, but should be intermediate between the other two methods.

The cost of the bags is the most expensive item· Growers should take every care to preserve them when not in use by ensuring that they are dried thoroughly and stored in a dry place free from vermin. With these precautions, all bags should last for two bunches, and the majority for three. Labour is the next greatest cost. Expense in this direction can be curtailed by efficient organisation. The cost of the dust is relatively slight, as only small quantities of dust are required, particularly when used in conjunction with bags.

The minimum profit which can be expected from the efficient application of rust control measures is represented by the return obtained for the fruit which would otherwise be unmarketable. The cost of control usually will be amply covered by the enhanced prices for the remainder of the fruit, due to the absence of rust and the improved quality. As the wastage in a bad thrips year may represent from 10 to 50 per cent. of the season's total crop, there is no doubt that rust control will pay handsomely except perhaps under extremely depressed market conditions.

A Word of Caution.

The control measures outlined in this article have been designed for conditions in the southern portion of the State. They have not been tested in North Queensland, where conditions are very different in many respects. Their value in these regions still requires investigation.

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WHAT IS GOOD FARMING?

Good farming demands the recognition of three basic principles: judicious economy in time, in labour, and in money. The farmer who can direct these successfully will eventually win through. Good farming makes management in every branch of farm production return a profit, and it also leaves a farm at the end of fifty years in a state of productivity as high as, if not higher than, at the beginning.—*W. Watson, General President, Agricultural Bureau of New South Wales.*

Parasites of the Pig.

F. H. S. ROBERTS, D.Sc., Entomologist and Parasitologist, Animal Health Station, Yeerongpilly.

[*First published in Q.A.J., Vol. XLII., Part 2 (August, 1934); revised October, 1937.*]

External Parasites.

THE principal external parasites of the pig include lice and mites, the latter being responsible for mange conditions.

LICE (*Hæmatopinus suis*). (Plate 164.)

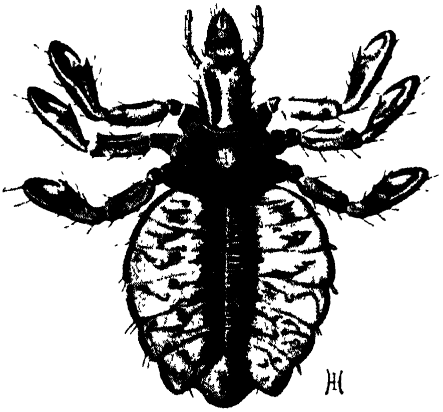

Plate 164.
Pig Louse (*Hæmatopinus suis*). Ten times natural size.

Pig lice, *Hæmatopinus suis*, are found everywhere in Queensland where pigs are reared. The species is one of the largest lice known and may measure up to one-quarter of an inch in length. The male is smaller than the female and may be distinguished readily by the presence of a black streak on the underside of the abdomen. The mouthparts consist of a proboscis or beak with which the louse is able to pierce the skin and suck up blood. This continual puncturing of the skin causes considerable irritation, which in time may lower the vitality of the animal to such a degree as to produce an unthrifty condition and render it more susceptible to attack by other parasites and diseases.

Life History.

Eggs deposited by the females are glued to the bristles of the pig and hatch in from 12 to 20 days, usually in about 14 days. The young louse is very similar in appearance to the adult, differing mainly in size. After hatching, the young lice commence feeding immediately, and after 10 to 12 days become mature. Lice may live as long as 35 days and during her lifetime the female lays about 90 eggs.

MITES.

Two species of mites infest the pig, each of which is responsible for a condition of mange. One species causes Sarcoptic mange, the other, Demodectic mange.

SARCOPTIC MANGE (*Sarcoptes scabiei suis*). (Plate 165.)

Sarcoptic mange or common mange is caused by the mite *Sarcoptes scabiei suis*. This mite is very small, at most only one-fiftieth of an inch long, and whitish in colour. The body is rounded with four pairs of short thick legs, and provided with a number of short backwardly projecting spines on its upper surface The parasites live in galleries under the skin in which the female lays her eggs. These eggs hatch in 3 to 10 days, and after another 10 or 12 days the young mite becomes sexually mature. There is thus a new generation produced at least every 13 days.

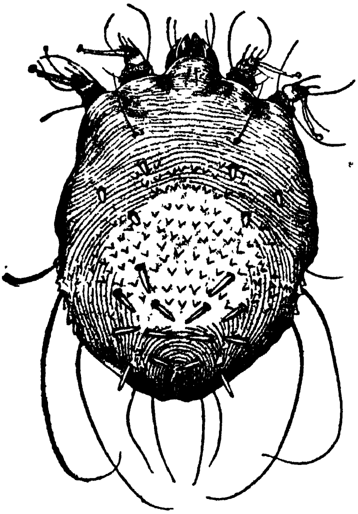

Plate 165.

Sarcoptic Mange Mite—Female. Magnified 100 times.

[*From Farmers' Bulletin* 1085, *United States Department of Agriculture*.

Symptoms of Sarcoptic Mange.

The burrowing of the mites through the skin causes the skin to become inflamed and swollen. At first, these inflamed areas are very minute, but in time they become very conspicuous and, as the mites increase, the lesions gradually coalesce. The irritation causes the animal to rub itself against any convenient object, the areas become raw and bleeding and large scabs are formed. The movements of the pig cause a continual breaking of the scabs, and blood and serum ooze out from the cracks. The bristles on the affected area fall out and eventually none, or only a few, remain. Later the skin becomes hard, thickened, and thrown into folds. In severe cases the animals affected become weak and emaciated and, unless treated, may die.

In the early stages of the disease the lesions occur usually on the head, around the eyes, ears, and nose, and from here the disease spreads along the neck and shoulders until the entire body may be affected.

DEMODECTIC MANGE (*Demodex phylloides*).

This type of mange is caused by a very minute worm-like mite, *Demodex phylloides*, and is much less common than Sarcoptic mange. The mites of Demodectic mange are microscopic in size, measuring only one one-hundredth of an inch. They spend their entire life in the hair follicles and sweat glands and, when in numbers, cause well-marked lesions. These lesions usually appear first on the snout or around the eyelids, and from there spread slowly over the throat, breast, abdomen, and other parts of the body where the skin is soft and thin. The affected skin becomes reddish and scurfy with numerous small hard nodules. These nodules eventually break and discharge a creamy pus, and many of them may run together to form suppurating cavities.

DIAGNOSIS OF PARASITIC MANGE.

The pig at times may be subject to many varied skin diseases, and for an accurate diagnosis of Sarcoptic or Demodectic mange it is best to submit samples of scrapings from the affected skin for examination. The scrapings, to include the mites, should be taken from the more recent lesions, and should be made deep enough to cause the appearance of blood. The scrapings then should be placed in a tightly-corked tube or bottle and forwarded for examination.

CONTROL OF LICE AND MANGE.

For the control of lice and mange, crude oil or fuel oil will be found satisfactory. The oil may be applied easily by hand, and in view of its adhesive and spreading qualities only comparatively small quantities are required. In the case of lice, a second application is desirable after fifteen days. For severe cases of Sarcoptic mange frequent dressings are necessary; but tests have shown that a complete cure may be expected if careful and persistent treatment is given. Before being treated with the oil, the affected animal should be scrubbed thoroughly with warm soapy water.

No specific cure is known for Demodectic mange, but frequent applications of crude oil check the disease. Animals not responding to treatment should be killed. Animals oiled with crude oil should be kept in the shade as much as possible until the oil has dried, as contact with the sun is likely to cause blistering, especially in the white breeds.

Hog oilers and medicated wallows and dips are recommended frequently as methods of controlling lice and mange. Hog oilers consist of posts wrapped round with oiled ropes or sacking and placed at some convenient spot, the idea being that the pigs will rub themselves against the post so that a small quantity of oil is deposited on or near the area of skin being rubbed. These devices tend to lessen the spread of lice and mange; but, as the pig will rub against any convenient object, are not to be depended upon to effect eradication or prevent the losses caused by heavy infestations.

By taking advantage of the pig's natural tendency to wallow in water, especially during warm weather, the use of crude oil on the surface of the water will be found satisfactory for the control of external parasites. The wallows should be constructed of concrete, and the water, with its film of oil, should be just deep enough to permit the nostrils being kept easily above the surface of the liquid. For pigs of 40 to 80 lb. weight the depth should not exceed three inches, six inches being the maximum for the largest pigs. If the depth is too great the animal will be afraid to lie down. The wallow should be roofed over to prevent the water becoming too hot. The wallow, moreover, should not be kept oiled continuously, but for short periods every ten days, until the desired results are obtained.

Dipping is one of the most effective treatments for lice and mange. For this purpose a concrete bath 40 to 48 inches deep, with a total length of at least seven yards, constructed on the same general principles as a cattle dip should be used. The dip is filled with water, on which crude oil is poured to a depth of four or five inches.

Attention should also be paid to sanitation. As lice will not live for more than three days off the pig, it is not considered that sties which have housed infested pigs would be a source of danger under sanitary conditions. It is always better, however, that such sties should be disinfected and cleaned thoroughly before clean pigs are placed in them.

Mange is highly contagious, and pigs showing symptoms of it should be isolated immediately. Visible lesions of Sarcoptic mange may develop in fourteen to fifteen days; so animals in contact with affected pigs should be isolated for this period. All litter and manure should be cleaned up and burnt and the sties given a thorough disinfection. It should be remembered that Sarcoptic mange is transferable to man; so it is advisable, after handling affected pigs, to bathe and have a complete change of clothing.

Internal Parasites.

No less than seventeen internal parasites or worms affecting the pig have been recorded in Queensland, but fortunately many occur only in small numbers and are not of any economic importance.

FLUKES AND TAPEWORMS.

In Queensland, flukes are unknown in the pig, except for rare instances when the liver fluke of sheep, *Fasciola hepatica*, has been observed in the liver.

The pig does not harbour any species of adult tapeworm but may act as a host for two larval tapeworms which reach maturity in the dog. These larval forms are known as *Cysticercus tenuicollis* and *Echinococcus granulosus*. Only the latter is of importance, as it is the cause of hydatids, which is a serious disease in man.

In the pig, the larval hydatid occurs usually in the liver and lungs, and consists of a bladder of fluid containing numerous minute white specks. Infestation may be prevented by seeing that the pigs are not given access to the fæces of dogs, by boiling all offal thoroughly before feeding it to dogs, and also by the regular treatment of all dogs with an efficient vermifuge to remove the adult worm.

Roundworms.

STOMACH WORMS.

Description and Life History.

Four species of stomach worms are known, of which two species, *Ascarops strongylus* (Plate 166) and *Physocephalus sexalatus*, may be of some importance. Both these worms are whitish in colour, up to seven-eighths of an inch in length, and are found usually at the exit end of the stomach. Their life histories are similar and very interesting, in that the eggs, when passed out in the dung, are eaten by various dung-frequenting beetles. In these intermediate hosts the eggs hatch and the larvæ undergo certain development. The pig can become infested only when it eats the beetle containing the larvæ.

Control.

Control consists in the daily removal of all dung and the clearing up of all litter, &c., which might afford shelter to the beetles. No efficient drug is known which will remove the parasites, but oil of chenopodium, as recommended for *Ascaris lumbricoides,* might be tried.

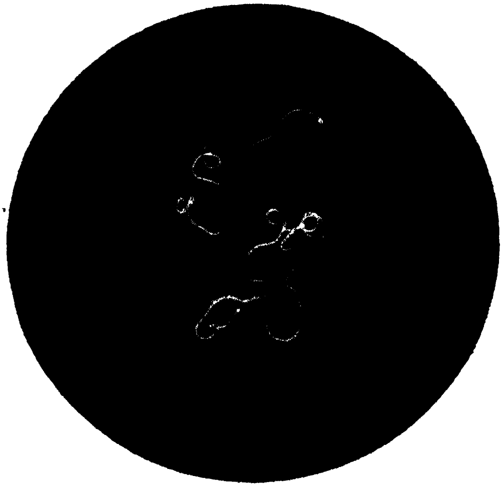

Plate 166.
STOMACH WORMS (*Ascarops strongylus*). Natural size.

THE LARGE ROUNDWORM (*Ascaris lumbricoides*).

(Plate 167, fig. 1.)

This species is one of the largest roundworms known and may grow up to 15 inches in length. The parasite occurs in the small intestine and frequently in very large numbers.

Life History.

The eggs laid by the female worms pass out in the dung, and under suitable conditions of temperature and moisture become infective in about eighteen days. These infective eggs when swallowed by the pig hatch and set free the young larvæ which bore immediately into the intestinal wall. From there they are carried in the blood stream to the liver, and still continuing their migration reach the blood capillaries, and are moved on to the heart, and from there to the lungs. About ten days after hatching the larvæ leave the lungs, move up the windpipe into the mouth, are swallowed, and reach the small intestine again, in which they settle down and grow to maturity.

Effect on the Pig.

Only young animals up to four and five months of age are affected by the large round worm. The larvæ, burrowing through the liver and lungs, cause serious disorders. Lung destruction may result in a condition of pneumonia, which sometimes may be fatal. A heavy infestation means a stunted and sickly animal, which becomes unprofitable. (Plate 168.) The invasion of the lungs by the migrating larvæ produces occasionally a condition known as "thumps," in which the breathing is laboured and bellows-like. More often, however, destruction of the lung tissue is shown by a short, hard, cough, which is especially prominent after exertion.

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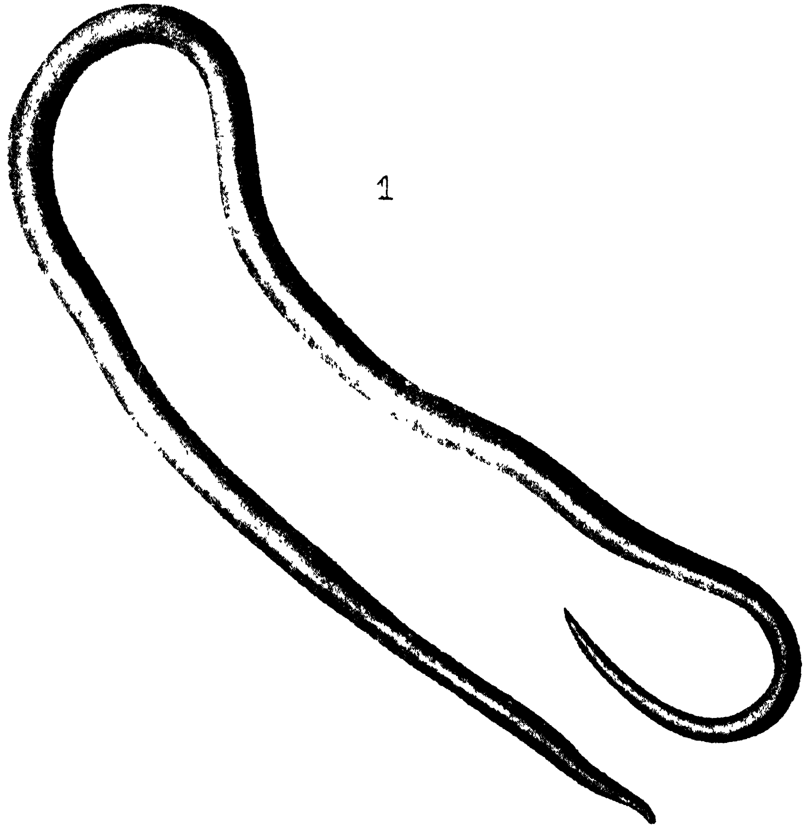

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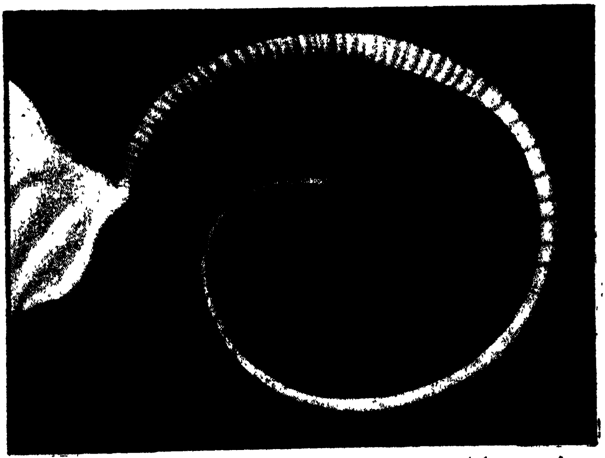

I. W. Helmsing. 1929.

Plate 167.

Fig. 1.—Large Roundworm (*Ascaris lumbricoides*).
Fig. 2.—Thorn-headed Worm (*Macracanthorhynchus hirudinaceus*).
Natural size.

Control.

Treatment of infested animals with oil of chenopodium at the rate of 1 cubic centimetre for every 25 lb. weight will remove the majority of, if not all, the worms from the small intestine. This drug is given with, or is followed immediately by, castor oil, 1 to 4 oz. being used, depending upon the dose of chenopodium administered. Animals over 12 months of age as a rule are not infected to such an extent as to require treatment. The animal to be treated should be starved for twenty-four hours before, and for four hours after, the drug is administered. It is not advisable to treat animals under six weeks old. As one dose of chenopodium cannot be depended upon to remove all the worms from every pig, the dose should be repeated after an interval of ten to fourteen days.

Although oil of chenopodium is highly effective in removing the worms from the small intestine, it is entirely without effect on the larvæ in the liver and lungs, and in order to minimise losses through the presence of this stage in the life cycle, preventive measures must be adopted.

Plate 168.

All these four pigs are from the same litter. The two smaller animals are infested with worms. The two larger animals are worm-free. Note the difference in growth.

During its lifetime the female worm is said to lay as many as 27,000,000 eggs; and as these are very resistant to adverse conditions, the sties and yards become contaminated so heavily with eggs that the animals swallow large numbers of infectious eggs every day. Sanitation therefore is the keynote of prevention. The daily removal of all dung, a good drainage system that keeps the yards and sties as dry as possible, the use of pens with concrete floors, and keeping the animals' food off the ground, are all necessary for the control of this parasite.

A system of pig-rearing in use in the United States has been highly successful in controlling, not only infestation by the large roundworm, but also infestations by other worm parasites. As Ascaris is harmful only to pigs up to four or five months of age, this method aims at keeping the young pigs away from the old contaminated yards till they reach this age. Certain modifications have been made which, it is considered, will make this system more practicable and more effective under Queensland conditions.

Certain of the sties are set aside for farrowing purposes only, and it is essential that these should have concrete floors. A few days before the sow is due to farrow the sty is given a thorough and careful cleansing and finally washed down with liberal applications of a boiling five cent. disinfectant solution. For this purpose any disinfectant with a high tar acid content, 25 per cent. and over, may be used. The solution should be made up, boiled and applied without delay to the floor and walls of the pen.

The sow should be washed with a warm soapy solution, and all dirt and mud crusts removed, particular attention being paid to the feet and udders. She then should be oiled to keep lice worry at a minimum, a second treatment being given after an interval of about fifteen days. In getting her into the prepared pen, she should be hauled and not driven.

After farrowing, the sow and litter are placed either on fresh ground or ground on which pigs have not been running for a number of years. For this purpose three separate pastures are advised. The one to be used by the young pigs should be prepared previously by sowing with a suitable forage crop, and, in order to avoid any wastage of land, the other two pastures could be given over to some profitable farm crop.

The period spent in the pen after farrowing depends on the number of sows farrowing. If only one or two sows are concerned, they and their litters may be placed in the pasture a few days after birth; but a three weeks' period may be necessary so that the young pigs may be strong enough to safeguard themselves against any possible robbing by their older and stronger fellows running in the same pasture. During these three weeks spent with the mother in the pen strict sanitation is necessary.

The young pigs are kept in the pasture till at least four months old. Next year, one of the two other pastures is used for the pigs, thus ensuring that each pasture is without pigs for a period of two years, during which time it is considered that if proper cultivation practices are adopted very little infection, if any, would be left.

In cases where no such pasture land is available, the farmer is advised to remove the top 9 to 12 inches of the old contaminated soil from the yard attached to the farrowing pen and replace it with new, clean soil, preferably sand. Only the young pigs should be allowed to use this yard, the exits from the pen being made too small for the sow to pass through. Strict supervision should be given to the cleanliness of the pen, which every two weeks should be washed down with a boiling 5 per cent. solution of disinfectant.

THE THORN-HEADED WORM (*Macracanthorhynchus hirudinaceus*).

(Plate 167, fig. 2.)

Description and Life History.

The thorn-headed worm is also a large species occurring in the small intestine, the female worms attaining a length of 7 to 16 inches. The parasite is whitish in colour, and its head is provided with an armed proboscis by which the worm attaches itself to the intestinal wall.

The eggs are passed out in the dung, and for the life cycle to be completed must be consumed by certain beetle grubs. The eggs hatch in the intestine of the grub, and the young larvæ forcing their way through the intestinal wall reach the body cavity, where they encyst. The pig, in rooting about, finds the grubs and eats them. The encysted worms are released, attach themselves to the wall of the small intestine of the pig by means of their proboscis, and eventually reach maturity.

Effect on the Pig.

The thorn-headed worm fortunately is not very common, but moderate to heavy infestations sometimes are seen. The worms are moving about continually in the small intestine and reattaching themselves, and consequently severe damage to the intestinal wall is occasioned. The infested animal shows evidence of great pain, may be subject to nervous disorders, and rapidly loses condition.

Control.

There is no drug known that can be depended upon to remove these worms, but the treatment as recommended for the large round worm may lessen the infestation. Strict sanitation must be maintained, and anything that will prevent the pig rooting around and eating the beetle grubs should be considered.

WHIP WORM (*Trichuris trichiura*). (Plate 169.)

This parasite gets its common name from its resemblance to a whip, the anterior portion being thin and thread-like, and the posterior portion comparatively stout. It is found in the caecum or blind gut and adjoining portion of the large intestine, and may measure from 1½ to 2 inches in length.

The eggs laid by the females pass out in the dung, and under suitable conditions of temperature and moisture eventually reach the infective stage. On being swallowed by the pig these infectious eggs hatch, and the young larvæ, making their way to the caecum and large intestine, reach maturity in sixteen to twenty days.

Control.

The whip worm is an exceedingly common species, and a heavy infestation may be distinctly harmful. Repeated treatments with oil of chenopodium may give results; but, owing to its location so far back in the alimentary tract the worm is difficult to reach with vermifuges. The sanitary measures as recommended for Ascaris should be applied for whip worm control.

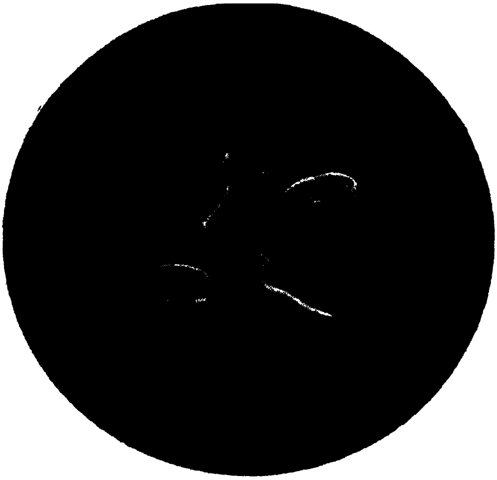

Plate 169.
Whip Worm (*Trichuris trichiura*). Natural size.

NODULE WORMS (*Œsophagostomum* spp.).

Description and Life History.

Two species of nodule worms are liable to infest the pig, namely *Œsophagostomum dentatum* (Plate 170) and *O. longicaudum,* the latter being comparatively rare. Both occur in the large intestine and are whitish or greyish in colour. They may measure up to half an inch in length.

The eggs, in this case, after passing out in the dung, hatch after a few days. The young larvæ feed in the dung for several more days before reaching the infective stage. The larva then is enclosed in a sheath which helps to protect it from adverse conditions. When swallowed by the pig the larva loses its sheath and burrows into the wall of the large intestine, causing the formation of a small nodule. After a period of development, the larva eventually breaks out of the nodule and settles down in the intestine, where it grows to maturity.

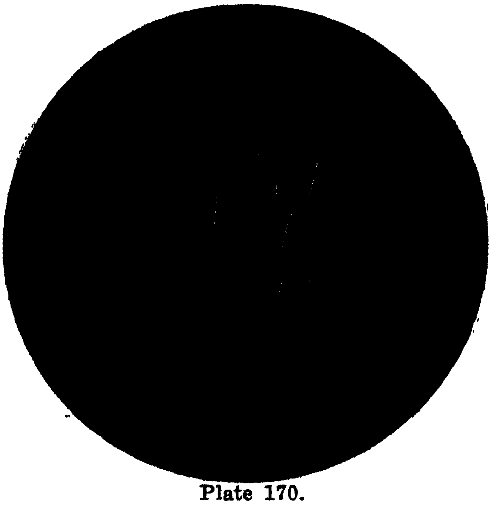

Plate 170.
Nodule Worm (*Œsophagostomum dentatum*). Natural size.

Control.

Nodule worms are most harmful to young stock, and a heavy infestation may result in general unthriftiness. No treatment with drugs is known to be effective for nodule worm, and the only control measures are concerned with sanitation.

LUNG WORMS (*Metastrongylus* spp.).

Description and Life History.

Two species of lung worms are known, *Metastrongylus apri* (Plate 171) and *M. pudendotectus*. Both are long, thread-like worms from 1¼ inch to 3 inches long, occurring in the air tubes of the lungs.

The eggs which are laid by the females contain active embryos which are passed out in the dung. Before its development can be completed the larva, after hatching, must be swallowed by an earth worm, the pig becoming infected when it eats the earth worm.

Effect on the Pig.

A light infestation causes no appreciable harm, but when in numbers, and especially in young pigs, the worms may cause a bronchitis characterised by a short, husky cough, and sometimes followed by pneumonia. The infested animals rapidly lose condition and, if bacterial complications arise, may die.

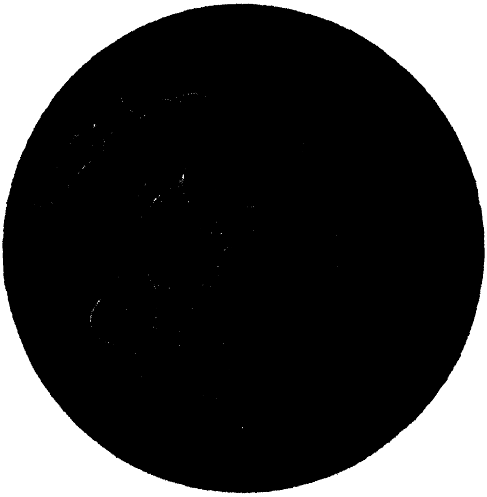

Plate 171.

LUNG WORM (*Metastrongylus apri*). Natural size.

Control.

Should an outbreak occur, the unaffected pigs should be removed immediately and the infested animals given good, clean water, nourishing food, and warm quarters. Good nursing is the best treatment for lungworm infestation. All conditions permitting the presence of earth worms must be attended to, and sanitation again is necessary for an efficient control of these parasites.

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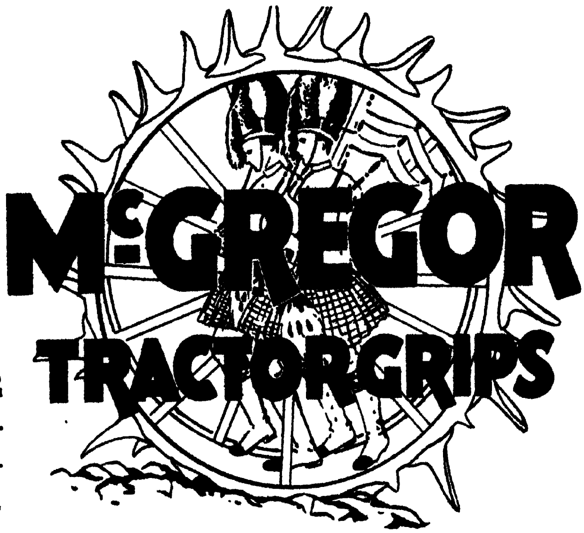

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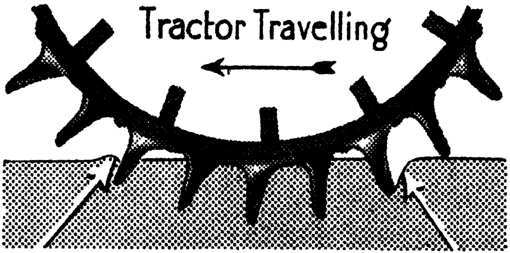

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The Grip when penetrating the soil slides forward on its concaved face, removing all resistance by its unique shape and set.

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KIDNEY WORM (*Stephanurus dentatus*). (Plate 172.)

Description.

This parasite is given the popular name of kidney worm because it is found in the vicinity of the kidneys. Mature worms are seen in the flare fat and occasionally in the kidneys themselves, and young stages of the parasite, whilst most prominent in the liver, may occur in the lungs and various other parts of the body. The mature kidney worm has a very distinctive mottled appearance, is relatively stout, and may grow up to two inches in length.

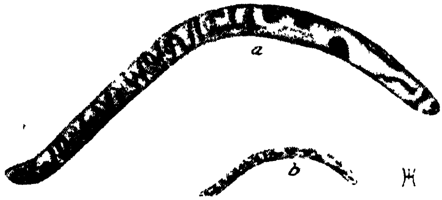

Plate 172.
Kidney Worm (*Stephanurus dentatus*). (*a*) Three times natural size. (*b*) Natural size.

Life History.

Only those females inhabiting the kidneys or kidney fat are sexually mature, and these lay eggs which eventually reach the exterior in the urine. The eggs hatch in one to two days, and five to eight days after hatching the young larvæ are ready to infest the pig. As in the case of the nodule worm, the infective larva is enclosed in a sheath. The pig becomes infected by swallowing these infective larvæ, or infection may occur when the larvæ burrow through the skin. In either case, the young worm eventually reaches the liver, where it remains for some months. After a period of five or six months the worms are mature and, leaving the liver, migrate to the kidney fat, where, if females, they commence to lay eggs.

Effect on the Pig.

Heavy infestations result in an unthrifty animal, owing mainly to the extensive damage to the liver caused by the young worms. The kidney worm is one of the most widespread parasites of the pig in Queensland, and is certainly a cause of serious wastage. The condemnation of pigs' livers and sometimes of infested carcases, and the unthriftiness of infested pigs, is regarded as one of the most serious economic losses the pig industry in Queensland has to contend with.

Control.

Owing to their location in the vicinity of the kidneys, these parasites cannot be removed by drugs given through the mouth, and only preventive measures will bring about a satisfactory control.

As the eggs and larvæ are rapidly killed by sunlight and dryness, yards and sties should be drained thoroughly and kept as dry as possible. All depressions and mud holes, especially those in the shade, should receive attention. Sties should be built of concrete, or else have slatted floors, which allow the urine to drain through to the ground beneath. All litter should be cleaned up constantly, as the soil so protected forms one of the most favoured sites of the infective larvæ. Yards and sties spelled for six months may be used with safety, as larvæ cannot survive for this period, even under optimum conditions.

The system used for Ascaris control may be applied here with certain modifications. The pastures are prepared as already stated, ploughing and cultivation being very effective in cleaning the land of infection. The food and water troughs in this case, however, are placed on bare, well-drained areas. The food troughs may be shaded, but the surrounding bare areas must be exposed to sunlight as much as possible. After feeding or drinking, the majority of the urine is passed on this bare exposed land, and the eggs and larvæ are killed rapidly by the sunlight and dryness. Paths used by the pigs throughout the pasture also should be kept bare and well exposed.

SANITATION.

Without sanitation little can be accomplished in the control of any parasite. Even though treatment with a drug may be depended upon to remove all worms, there is little advantage in its use if the animals are able to become reinfested immediately afterwards. So far as the pig is concerned, prevention assumes an especially prominent place in worm parasite control, for there is only one species for which an efficient vermifuge is known. This species is the large roundworm, and even here treatment is of no effect against the more harmful phase in the life cycle—namely, the migrating larva. This point emphasises the need of good sanitation, which, by the elimination of conditions favouring the development of the life-cycle stages spent outside the pig, considerably reduces the chances of infestation. The principles of good sanitation are outlined herewith:—

1. *Sties*—In the construction of a sty the farmer should aim at concrete floors. The initial expenditure may be high, but the result is shown in the ease with which such sties may be kept clean and in the subsequent good health of the pigs. Earthen floors in sties should be abolished entirely as it is impossible to keep them clean and dry.

2. *Dung.*—All dung should be removed daily. The dung carries the eggs of those parasites inhabiting the alimentary canal, and its regular removal and disposal is important. If desired for fertilizing purposes, it should be spread out immediately in the pastures. It must be understood that pastures so treated should not be accessible to the pigs; otherwise the dung should be buried under 1 foot of soil. Pig dung is a favoured breeding medium of the house fly, which, when in numbers, not only becomes an annoyance to the animals, but also plays a very prominent part in the spread of disease. The proper disposal of the dung is important from this aspect also.

3. *Drainage.*—Moisture is a necessary factor for the development of the free living stages of all worm parasites, and in its absence very few of these can survive for any length of time. A good drainage system therefore is an essential for good sanitation, and the progressive pig raiser will see that all depressions are filled

in and that mud holes are not permitted. If wallows are considered necessary, they should be built of concrete and cleaned out and disinfected frequently.

4. *Feeding.*—Food never should be thrown on the ground, but always should be supplied in sanitary food troughs. These are best built of concrete, evenly divided by round iron cross pieces, to prevent the animals lying in them. In yards, such food troughs should be surrounded by a concrete floor raised above the level of the ground and sloping away from the trough. The use of hoppers for dry rations is recommended.

5. The runaways and yards should be kept as free of litter as possible. Accumulations of corn cobs, &c., will protect any infection in the soil beneath from such adverse conditions as sunlight and dryness.

THE ADMINISTRATION OF VERMIFUGES TO PIGS.

It must be remembered that the pig has a peculiarly narrow throat, and great care must be taken when administering drugs. With liquids the danger is somewhat increased, as they are apt to enter the lungs and suffocate the patient. Oil of chenopodium and castor oil, however, may be administered quite safely if the directions given below are followed carefully. The required amounts of the drug and castor oil are measured out and thoroughly mixed. Young animals are set up on their tail and between an assistant's legs, the mouth opened by a spreader or gag, and the vermifuge administered very slowly over the back of the tongue by means of a syringe with a long curved nozzle. *The liquid should be given slowly and ample time allowed for the animal to swallow.* Care should be taken not to force the head up too far.

Animals too big to be handled in this way are best placed in a crate or crush. A leather strap is used to elevate the upper jaw and bring the mouth level with the shoulder tops, the drug then being administered with the syringe in the manner described above. Failing a syringe, an old boot from which the toe has been removed is used occasionally for administering liquids; but with the syringe the work is quicker and each animal is given a full dose.

Oil of chenopodium may also be obtained in capsules. It is not always an easy matter, however, to dose pigs with capsules, and as, in any case, the capsules would have to be followed by castor oil, it is considered that the simultaneous administration of the drug and castor oil is much easier for the operator.

The administration of chenopodium in food is recommended sometimes, but is not considered an effective treatment.

◆

DOCTORING THE CALF.

One of the first signs that a calf is "out of sorts" is loss of appetite. When a calf refuses to take its milk give it a dose of castor oil. A tablespoonful of oil is shaken up with a little milk and hot water until an emulsion is formed. The dose is then poured down the calf's throat.

A bottle of castor oil should be kept always in a handy place. Another bottle with marks filed at tablespoonful levels should be kept for administering the dose. After use the bottle should be rinsed first with milk and then two or three times with hot water.

Sown Pastures and Their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Research Officer.

[*Continued from p. 280, Part 4, Vol. XLVIII.—September,* 1937.]

(PART IV.)

Couch Grass (*Cynodon dactylon* Pers.).

Origin and Distribution.—Couch grass is widely spread in Queensland as a pasture plant, as a lawn grass, and as a weed of gardens and cultivations. It is probably native to Australia, but is common also in many other countries. It is highly valued for grazing purposes in the Southern United States of America, where it is known as Bermuda grass, and in India, where the name Doub grass is given to it.

Description.—In habit couch grass is a perennial, low-growing grass which produces slender, creeping runners that may reach a length of several feet and which root at the joints It possesses, in addition to surface runners, thin, underground, creeping stems. The habit of the grass varies considerably according to the nature of the soil and the climate experienced, but it seldom reaches a height of more than 12 inches. The slender flowering stems terminate in between two and five purplish spikes from 1 to 2 inches in length.

Climatic Requirements.—The chief growing period of couch grass is during the summer months. Growth is retarded by cold weather, and is checked almost entirely by severe frosts, but the plants are seldom killed by cold. The grass is extremely drought resistant, though it is not productive under dry conditions.

Soils.—Couch grass requires a fertile soil for its best development, but will grow on an extremely wide range of soil types, from beach sands to dry, alkali soils. It does best on fertile, light loams, particularly on alluvial flats.

Planting.—Flowering heads are produced in abundance during the warmer months of the year, but the heads shatter badly when the seed is formed, and commercial samples of seed often show a germination percentage of less than 30. Good seed, germinating as high as 92 per cent., is available at times, and should be used in preference to cheap, unreliable lines. From 5 to 8 lb. of good seed are sufficient to sow an acre. For planting small areas it is usually preferable to employ rootstock or stem cuttings if they are available, spacing them 18 inches apart in drills struck out at intervals of about 2 ft. Sowing or planting should be carried out during spring or summer.

Owing to its smothering action on most other pasture plants, couch grass is usually not employed in pasture mixtures, but sowings of the grass may be improved by the addition of a suitable legume. In coastal districts the common lespedeza (*Lespedeza striata*) mixes well with couch grass.

Management.—Couch grass pastures are fairly easy to manage, as they are not readily eaten out by stock. However, intermittent grazing is recommended in order to make the most efficient use of the pasture.

Conservation.—Owing to its relatively short growth, couch grass is seldom cut for hay or ensilage.

Feeding Value.—The feeding value of couch grass, particularly when growing on good quality soils, is excellent, and the palatability and digestibility of the grass render it a first-class grazing plant for all classes of stock.

Special Uses.—In addition to its usefulness as a pasture, couch grass may be employed for the fixation of sandy soils or of slopes subject to erosion, and also for green formation on aerodromes, lawns, golf links, &c.

Undesirable Features.—By virtue of its persistent habit couch grass is very troublesome when it invades cultivation areas.

Blue Couch Grass (*Digitaria didactyla* Willd.).

Origin and Distribution.—Believed to be a native of Queensland, blue couch grass is little known outside the State. It is most prominent in the coastal section south of Gladstone, where it has established itself on large areas of cleared or ringbarked forest country.

Description.—Blue couch grass closely resembles the ordinary couch grass in habit, having slender, creeping stems and fine leaves. The seedhead is somewhat smaller and has fewer rays than that of couch grass. The foliage has a bluish tinge.

Climatic Requirements.—The climatic conditions of the South Coast and North Coast districts are best suited to blue couch grass. Its main growth is made during the summer months, and the plant is dormant in the winter. Though it produces well on dry soils in normal seasons, blue couch grass is not particularly drought resistant, and suffers more from dry conditions than does the ordinary couch grass. It is also more susceptible to damage by frosts.

Soils.—Whilst it produces a large bulk of feed on rich soils, blue couch grass is most usefully employed on dry, shallow soils on which grasses of higher value will not thrive.

Planting.—Though the natural spread of blue couch grass must be effected to a large extent by means of seed, the percentage of viable seed in samples collected for examination has been low, and as a consequence seed is unobtainable commercially. Little difficulty is experienced in getting pieces of the runners to strike if planted in wet weather during the warm months of the year.

Management.—The areas devoted to blue couch grass on dairy farms generally are the large paddocks of second-class country unsuitable for the better quality cultivated pasture grasses, and intensive management of these poorly subdivided areas is unwarranted in most instances. Whilst the grass is able to withstand poorly controlled grazing, where subdivisional fences exist some form of intermittent grazing should be practised.

Conservation.—Owing to the difficulty of cutting the matted growth made by blue couch grass on fertile soils, and to the fairly sparse stand on inferior soil types, no conservation of surplus grass is undertaken.

Feeding Value.—The palatability and feeding value of blue couch grass are quite good, though cream production is lower on blue couch grass pastures than on paspalum pastures.

Seed Production.—Collection of seed of this grass is not carried out in Queensland owing to the low percentage of viable seed set.

Pests and Diseases.—Except under lawn or green conditions, pests and diseases are of little importance to blue couch grass.

Special Uses.—Blue couch is widely used for lawns and greens, and where the moisture supply can be kept up in dry weather and heavy frosts are not frequent the grass is admirably suited to these purposes.

Undesirable Features.—The grass shows a tendency to invade paspalum pastures and supplant the paspalum in certain situations. The effect probably is due to soil fertility conditions, and an improvement in soil fertility is indicated if the paspalum is to be retained.

Water Couch Grass (*Paspalum distichum* L.).

Origin and Distribution.—Though water couch is common in many warm countries, particularly in the Americas, and is fairly widespread in wet, tropical and sub-tropical parts of Australia, there is some doubt as to the original home of the grass. If not native to Australia, it certainly has been naturalised for a great many years.

Description.—Water couch is a perennial grass which creeps by means of fairly slender stems that usually root at the nodes. The ends of the otherwise prostrate stems turn upwards, and it is at these extremities that the leaves are most dense. The seed-stalks also are produced from the stem tips. The seed-head is made up of two spikes of small, flat "seeds."

Climatic Requirements.—A moist, warm climate is favoured by the grass, and consequently it is found most commonly along the coastal strip. It is mainly a summer grower, and is cut back by frosts. Extremely heavy or frequent frosts often destroy the grass.

Soils.—Soils abundantly supplied with moisture are essential for the full development of water couch.

Planting.—Seed of water couch is not obtainable on the market, and the grass is propagated by planting pieces of the creeping stems. These strike very readily if planted during the warm months, and spread quickly.

Management.—Because of its habit of rooting freely at the stem joints, water couch is well able to withstand heavy grazing, but intermittent grazing should be practised.

Conservation.—On the coast it is extremely difficult to make a green hay from this succulent grass, but in drier localities a rough-looking hay may be conserved.

Feeding Value.—Whilst the feeding value of water couch grass is fairly good, more particularly for fattening purposes than for milk production, the grass is not a specially good fodder.

Seed Production.—Though a certain amount of viable seed is set, owing to the difficulty of collecting the seed and to the ease with which propagation by means of cuttings may be effected no seed collection is undertaken.

Pests and Diseases.—Water couch is susceptible to attack by the paspalum ergot fungus.

Special Uses.—The grass is a very effective soil binder in damp places.

Undesirable Features.—Whilst useful in certain situations, water couch is a pest under certain circumstances. Once it has invaded a cultivation paddock it is extremely difficult to eradicate, and its presence in bore drains, irrigation channels, &c., is also undesirable.

Buffalo Grass (*Stenotaphrum secundatum* O.K.).

Origin and Distribution.—Though native to the coastal districts of the warm regions of America, buffalo grass is now naturalised in similar areas all over the world. It is quite common in coastal Queensland, either distributed naturally or as a relic of earlier sowings.

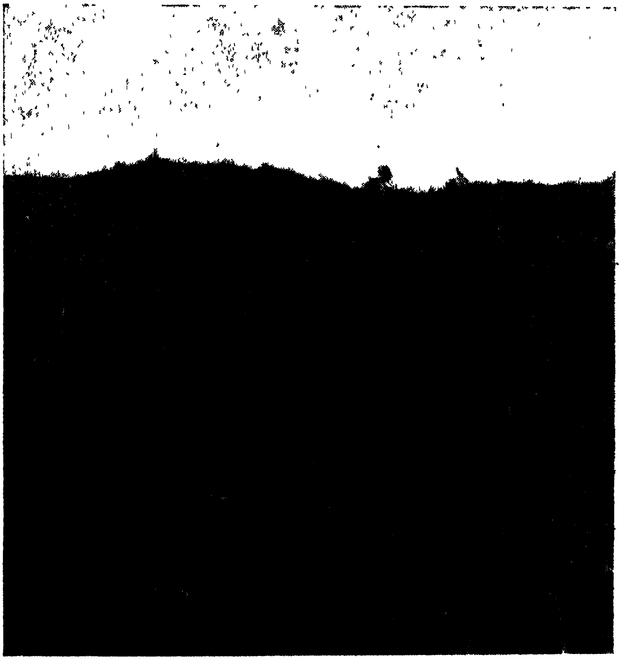

Plate 173.

Buffalo grass on an eroded bank.

Description.—Buffalo grass (Plate 173) is provided with surface runners that root and shoot at the joints, and also has underground stems. It spreads freely in all directions, and the runners produce coarse, erect leaves up to 12 inches in length. The seedhead consists of a broad, flat stem with a number of closely appressed flowers scattered over it. The grass forms a very cushiony mat.

Climatic Requirements.—For pasture purposes buffalo grass is of use only in coastal districts. It is chiefly a summer grower, but thrives in shady situations as well as in sunny positions. It is moderately drought resistant, and will withstand a certain amount of frost.

Soils.—A wide variety of soil types will support buffalo grass. It is common on sandy country close to sea beaches, and does well on heavy clay soils. It does not require a high measure of soil fertility for its existence.

Planting.—Seed is formed very sparingly, and stem cuttings are used for propagating the grass. The best time to set these out is in the spring.

Management.—The growth produced by buffalo grass should be utilised at an early stage, since the older growth is of inferior feeding value. Occasional harrowings should be made in order to renovate the turf.

Conservation.—The mat produced is too dense to permit of the grass being mown for hay or silage.

Feeding Value.—Young, leafy growth of buffalo grass has a fair feeding value, but fibre increases rapidly with age.

Seed Production.—Collection of seed is not carried out.

Digitaria Species (Woolly Finger Grass, &c.).

Origin and Distribution.—Woolly Finger grass and related grasses (Plates 174 and 175) are natives of Africa. The whole group has been intensively studied for some years by the South African Department of Agriculture, and over 150 types have been recognised. Several of these have been introduced to Queensland for trial purposes, and numerous farmers and pastoralists have laid down small observation plots. Results to date suggest that some varieties may prove useful in various parts of the State.

Plate 174.

Digitaria Pentzii (Woolly Finger Grass).

Description.—Wide differences in the structure and habit of growth of the numerous types of *Digitaria* exist, and have been classified by research workers. Practically all are creeping grasses, but some form a large tuft before sending out runners; others send out runners (occasionally resembling flower stems) as soon as the plant begins to grow; some form underground as well as surface creeping stems; and various other types exist. The leaves and runners vary a good deal, as does the seed-head, though the latter is always of the hand-like type. The following descriptions of the most promising forms in Queensland are taken from "The Grasses of Southern Rhodesia," by S. M. Stent and J. M. Rattray:—

Digitaria Pentzii.—This is a shallowly rooted, tufted perennial that sends out fairly long rooting and shooting runners. These runners are very characteristic of this species; the internodes are short, seldom more than 3 inches long, and dense fascicles of shoots are developed from each node, which, if it is able to reach the ground, roots firmly, early establishing a new plant, the internodes soon dying off. The sheaths, especially the basal, and sometimes the leaves, are softly to densely hairy. The Vryburg form is the famous "Woolly Finger grass."

Digitaria seriata or Digitaria Polevansii.—This is a perennial with tall and somewhat bulbous culms (stems), covered with short, densely and softly hairy cataphylls (scales) at the base and springing serially from short, creeping rhizomes. The long, stout surface runners have internodes up to 8 inches long. In its natural state the bare culms and wiry stolons, with long internodes, do not suggest a promising pasture grass, but in Pretoria, where it has been brought under cultivation, excellent results have been obtained with it in this capacity.

Digitaria milanjiana.—This is a very blue grass, with the same creeping rhizomes as *D. Polevansii,* but with the addition of long surface runners with long, reddish internodes and rooting nodes. The long surface runners do not root or form fresh plants as readily as *D. Pentzii.*

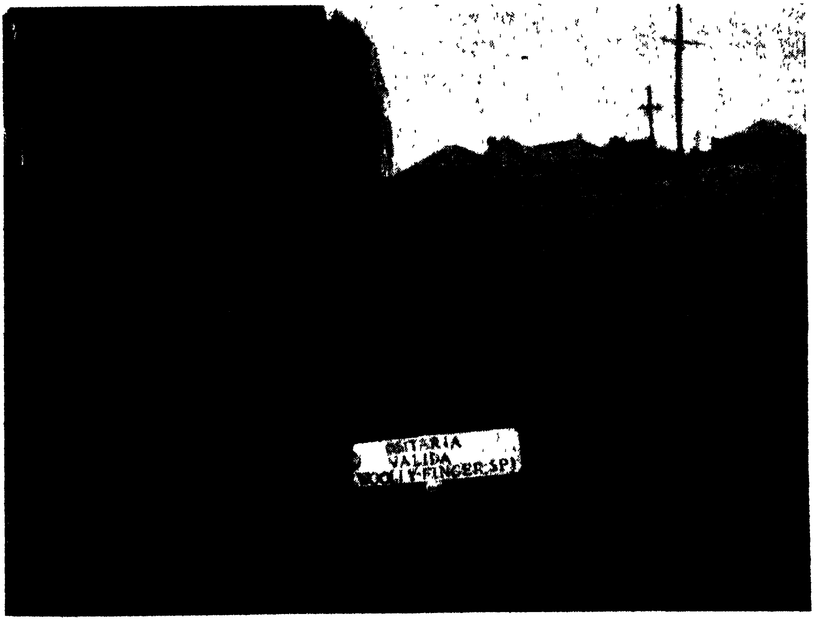

Plate 175.
Digitaria valida (an African Finger Grass).

Digitaria valida.—This is somewhat similar to *D. Pentzii,* but is taller and coarser and has stouter rhizomes. The leaves are short and broad.

Climatic Requirements.—Some of the *Digitaria* types occur naturally in areas of low rainfall, and others in high rainfall regions. All are summer growers. *D. Pentzii* and *D. valida* are reported to give best results in South Africa under a rainfall of 20 to 30 inches per annum; *D. Polevansii* is useful in semi-arid areas, while *D. milanjiana* comes from an arid region. A South African classification of types shows that the high rainfall types have the growing eyes deep under the ground, and the basal shoots are usually brown, hard, and long.

Soils.—In South Africa *D. Pentzii* is said to do best on red loam soils, but can be grown on practically any well-drained soils. *D. Polevansii* prefers sandy soils; *D. valida* thrives on red and shaly soils. The sandy soil types have been shown to possess "swollen nodes and bulbous growing eyes under the soil, whereas those which grow on hard soils have the growing eyes flat against the closely compacted basal shoot."

Planting.—Though most types flower fairly freely, the amount of seed set is very variable. No data are available for Queensland-grown seed, but it is reported that in South Africa the percentage of florets which set seed varies from 0 to 80. Seed has not been collected in any quantity in Queensland, and propagation is carried out by planting rooted pieces of the large tufts or plantlets which are developed at the joints of the runners. The best method of planting these has been described in an earlier section dealing with "Methods of Planting and Covering."

Management.—The pasture types of *Digitaria* are especially resistant to heavy stocking and close grazing, and have good recuperative powers. Intermittent grazing should, however, be practised.

Conservation.—Certain strains are reputed to be suitable for hay-making, but no tests have been made in Queensland. The forms under trial in this State make a dense growth, but can be mown fairly readily.

Feeding Value.—The palatability of most forms is high and the feeding value of young growth quite good.

Seed Production.—As already stated, seed is set in too small a quantity to warrant collection for sowing purposes.

Pests and Diseases.—Though minor pests and diseases cause slight damage in some instances, no serious effect has yet been observed.

Special Uses.—All the *Digitarias*, but more particularly the forms with both underground and surface runners, are effective soil-binders.

Undesirable Features.—The underground stems, which are largely responsible for the persistency of the main types of *Digitaria* under grazing conditions, render eradication of the grasses difficult; consequently the *Digitarias* should not be sown on areas likely to be required later for cropping nor adjacent to cultivation areas.

African Star Grass (*Cynodon plectostachyum* Pilger).

Origin and Distribution.—A native of East Africa, where it is an important grazing grass, this star grass has been introduced with some success to other parts of Africa, and a few years ago was brought to Queensland. Exploratory trials have shown the grass to hold some promise for coastal conditions at least.

Description.—African star grass (Plate 176) is a close relative of the ordinary couch grass, and, like the latter, is a perennial grass spreading by means of runners that root at the joints. There is little or no development of underground runners. Erect or straggling leafy stems are produced from the prostrate runners and form a dense mass of leafy material up to 2 feet in depth. The leaves and younger stems are soft and succulent. The seedheads resemble those of the ordinary couch grass, except that there are generally two whorls of radiating spikes instead of one.

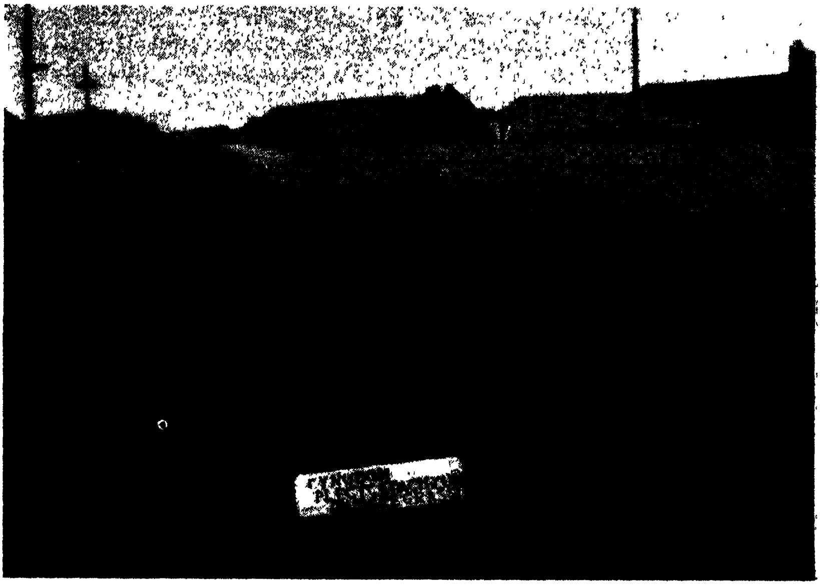

Plate 176.
African Star Grass.

Climatic Requirements.—The grass is mainly a summer grower, and in Queensland has shown promise in areas experiencing between 25 and 60 inches of rainfall per annum. Whilst its drought resistance appears to be moderately high, it is extremely susceptible to frost injury.

Soils.—Fertile loams, including the heavy loams, appear to be the favoured soil types. On light soils growth is less vigorous.

Planting.—Seed is not produced very freely, and the percentage of viable seed is low. In plantings which have been made in Queensland stem cuttings have almost invariably been used. These are best planted in moist land in early summer, the short pieces of stems with roots at the joints being planted in furrows and firmed by tramping.

Management.—Intermittent grazing should be practised. Under dry conditions recovery after grazing or cutting is slow, though where rainfall conditions are satisfactory the intervals between grazings need only be short.

Conservation.—The soft, succulent growth of African star grass is reputed to make a good hay if properly cured, but African experience indicates that a long curing period and frequent turning are necessary to produce a quality hay.

Feeding Value.—Chemical analyses of the grass have shown it to contain a very large proportion of nutrients, and there is no doubt that the grass is of high feeding value. Its palatability to all classes of stock is excellent.

Seed Production.—To date the grass has been established in Queensland by means of vegetative material, and it is unlikely that work aimed at improvement of seed production will be undertaken here for some little time.

Special Uses.—Its creeping and mat-forming habit gives the grass some value as a soil binder.

Undesirable Features.—As is the case with all vigorous grasses, there is some danger of African star grass becoming a pest of cultivation areas. Its aggressiveness and persistency are, however, such that it is not likely to rank with couch grass or kikuyu grass as an almost uneradicable weed.

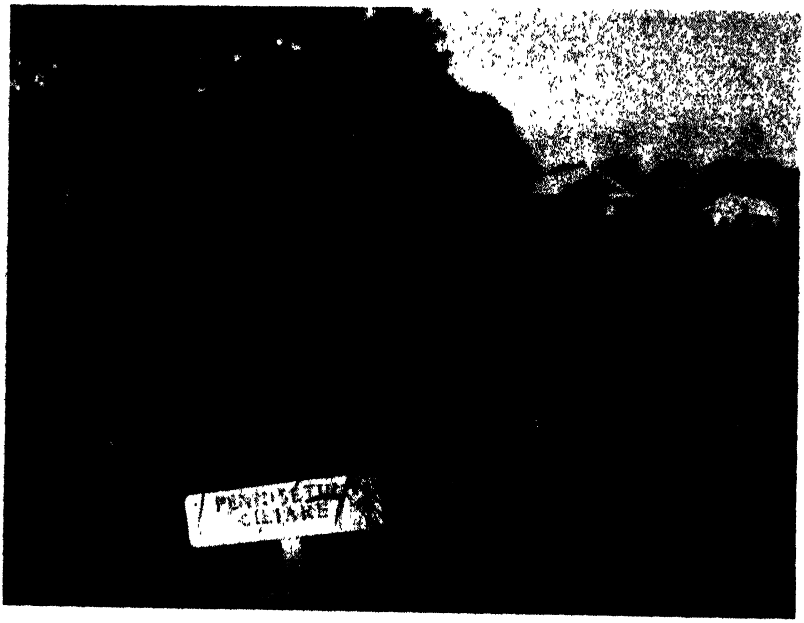

Plate 177.
Buffel grass.

Buffel Grass (*Cenchrus ciliaris* L.).

Origin and Distribution.—Buffel grass occurs naturally in various forms in tropical and sub-tropical portions of Africa and Southern Asia. It was introduced from India to North-western Australia in 1915, and both African and Asiatic strains have been tested in the various States of the Commonwealth. The grass is still more or less in the testing stage, and further information, particularly with regard to the probable detrimental effect of its burrs on wool, is required before it can be recommended for planting.

Description.—The several forms of buffel grass show a great variation in growth habits, but most are perennial in nature and spread by means of underground runners. Usually the subterranean stems are fairly short, but a large number of erect shoots is produced. (Plate 177.) The leaves are often rather harsh and hairy, especially in the leafier types. The seedheads, which are of a fox-tail shape, are borne on rather short stems, and the large "seeds" bear a number of bristles, particularly at their bases.

Climatic Requirements.—Buffel grass is a summer-growing grass, and is best adapted to summer rainfall districts. Provided the rainfall is fairly reliable, buffel grass is suited to areas with as low an average annual rainfall as 20 inches. The grass is very drought-resistant, but the leaf growth is damaged by frosts.

Soils.—Well-drained and fairly dry soils of a sandy or loamy nature are preferred by the grass. In clay soils the extension of the underground runners is checked to some extent.

Planting.—Seed was at one time available on the market, but the demand was too small to warrant seed collection on a commercial scale. Germination tests of hand-stripped seed have shown a percentage germination of about 50. Little information is available as to the capacity of the plant to establish from seed. The underground stems are very hardy, and the grass may be propagated by planting small pieces in the spring or summer. Establishment is, however, not particularly ready.

Management.—Buffel grass is well able to withstand heavy grazing and cutting, but sufficient interval between defoliations must be allowed for recovery.

Conservation.—Certain of the strains are of a useful hay type, and two or three cuttings may be made in a season. The quality of the hay is reputed to be excellent. In India the grass has been dried artificially, with the production of a good-quality feed.

Feeding Value.—Some observers report the grass to be unpalatable when green, and avoided by stock. In other instances stock have taken quite readily to the young grass. A good deal may depend upon strain and on soil type. The feeding value of the young growth is good, but the dry, stemmy material is of little feed value.

Seed Production.—The ripe seed does not shatter early, and collection by hand-stripping is easy.

Pests and Diseases.—The grass does not appear to be subject to damage by insect or fungus pests, at least in trial plots.

Undesirable Features.—The bristles attached to the "seeds" of the grass might render it of some danger in sheep districts, owing to the difficulty of removing the seeds from the wool.

Tassel Grass (*Chloris distichophylla* Lag.).

Origin and Distribution.—Tassel grass, which is better known in Queensland as frost-resistant or winter-growing Rhodes grass, is a native of South America that has been naturalised in Queensland for many years. Its most common occurrence is as a weed of waste places, but within recent years it has been cultivated to a slight extent for grazing purposes.

Description.—The grass forms dense tufts and has long, broad, succulent leaves (Plate 178). It does not develop the long surface runners which are characteristic of Rhodes grass. The seedhead is of the finger type, and the number of rays may be as many as forty-five.

Climatic Requirements.—It is reported that the main natural distribution of tassel grass in Queensland is in the Moreton and Wide Bay

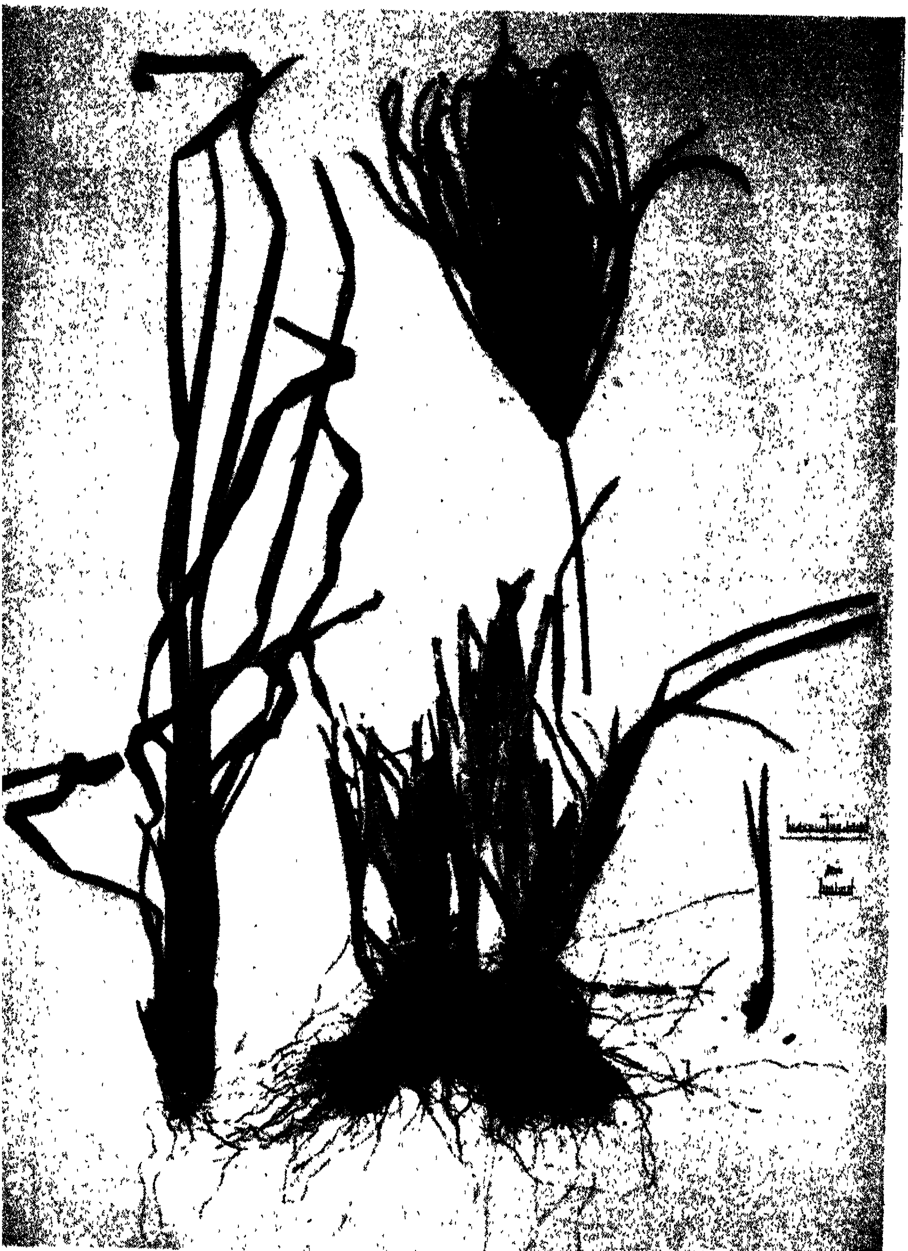

Plate 178.
Tassel grass.

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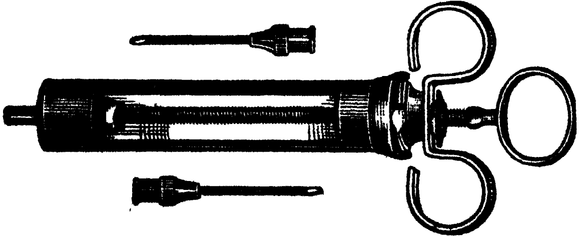

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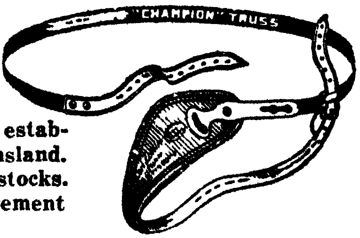

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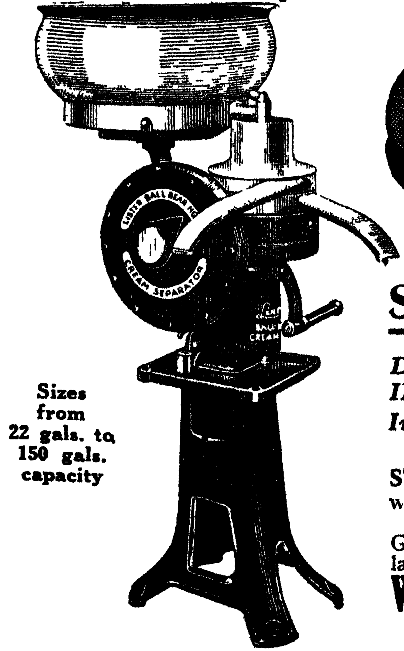
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districts, and it is in these areas that it is chiefly cultivated. The grass requires a moderate summer rainfall. It frosts much less readily than does Rhodes grass; but its production during the cool months is not high.

Soils.—A fairly fertile soil is necessary for good results.

Planting.—Spring or summer sowing of the seed is desirable, and the grass should be sown down on cultivated land worked to a fine tilth.

Management.—The management of tassel grass pastures is complicated by the fact that the grass contains a fairly high proportion of a prussic-acid-yielding glucoside at certain stages. Since the period at which the grass can be safely grazed has not been determined, care in grazing must be exercised.

Undesirable Features.—Because of the danger of stock-poisoning, it is considered inadvisable to sow tassel grass for grazing purposes, particularly as it has little advantage in other respects over various other grasses.

Cowcane (*Saccharum officinarum* var.).

Origin and Distribution.—Cowcane is a variety of sugar-cane used in Queensland almost exclusively for feeding dairy stock.

Description.—Cowcane is a tall, tufted plant which stools freely and produces numerous erect stems, which vary in size and leafiness according to variety. It is perennial in nature, remaining green throughout its lifetime, which usually extends over several years.

Climatic Requirements.—The climatic conditions required by cowcane are similar to those needed by the ordinary sugar-cane—namely, moist, warm summers and frost-free winters. Varieties of cowcane have been produced which are somewhat resistant to frost injury, but planting in protected localities is recommended. The drought resistance of cowcane is high, and during dry times a small acreage of the crop often suffices to keep stock alive for long periods.

Soils.—Cowcane prefers a deep, rich, well-drained soil, and requires to be planted on cultivated land. Low-lying areas subject to water-logging are unsuitable.

Planting.—As with sugar-cane, stem cuttings, and not seeds, are used for planting purposes. Each cutting or "set" should have three or four well-developed buds, and the sets are planted in fairly deep furrows 4 feet 6 inches apart, the sets being spaced about 2 feet apart in the furrows. The sets are lightly covered at first, and the furrow gradually filled in as the shoots emerge towards the surface. Cultivation between the rows is essential while the plants are still young. Varieties suitable to the district should be used.

Management.—Cowcane is not suitable for grazing, but should be cut and, if at all old, chaffed before feeding to stock. Over 20 tons per acre at the first cutting may be expected in most instances. The canes should be cut off just below the surface of the soil with a cane knife. After the crop has had its first cutting cultivation between the rows should be carried out to promote a good ratoon growth in the spring.

Feeding Value.—Because of its high fibre content, cowcane is not a good feed for cows in production. Its chief value is as a maintenance feed for stock during the months when good pasture is scarce.

Seed Production.—Cowcane does not set seed.

PERMANENT SUMMER-GROWING LEGUMES.

Lucerne (*Medicago sativa* L.).

Origin and Distribution.—Lucerne is a native of Central Asia which has been cultivated for many centuries, and is now grown in practically every country in the world. It was one of the first crop plants introduced to Australia, and is cultivated extensively in all States both for hay and for grazing.

Description.—The lucerne plant is perennial in habit, and possesses a deeply-penetrating taproot and numerous erect leafy stems rising from a crown. The leaves consist of three leaflets, which vary in shape and size according to variety. The most common type in Australia is the Hunter River type, which is suited to most Australian conditions, and has been found superior to imported types so far tested.

Climatic Requirements.—The Australian type of lucerne is mainly a summer-growing plant, but in mild winters makes appreciable growth. It requires a large quantity of moisture to produce a good crop, but can be cultivated quite successfully in fairly dry areas provided ample supplies of subsoil moisture are available to the deep roots. Where the watertable is not too far below the surface, lucerne is particularly resistant to dry and hot conditions. Its frost resistance is high. Generally speaking, it may be said that lucerne can be grown without irrigation in all the agricultural and dairying districts, and under irrigated conditions is suitable to most parts of the State, provided soil conditions are satisfactory.

Soils.—Lucerne prefers a well-drained, fertile soil of good depth, but will grow with some measure of success on a wide variety of soil types, ranging from light sands to heavy clays. Good drainage is essential. A poorly drained soil may be recognised in many instances by the presence of yellow, brown, orange, or grey mottlings, and where these are found within 2 or 3 feet of the surface the soil is likely to be unsuitable for lucerne-growing. Impermeable clay or rock formations at a shallow depth render a soil unsatisfactory for the crop. For its normal development lucerne requires a soil well supplied with lime, and in heavy rainfall districts it cannot be grown satisfactorily unless the natural acidity of the soils is reduced by the application of lime.

Planting.—The purposes for which lucerne is sown in Queensland include the following:—(*a*) As a cash hay crop; (*b*) as a summer hay crop, followed by winter grazing; (*c*) as a grazing crop; (*d*) as the leguminous element in a mixed pasture. The cultivation of lucerne for hay purposes is the subject of a separate publication of the Department of Agriculture and Stock, and will not be dealt with here.

For whatever purpose sown, lucerne must be laid down on a well-prepared seed-bed. Whether it is freshly cleared scrub or forest land, newly broken-up native or cultivated pasture, or old land being thrown out of wheat, the area must receive a thorough preparation in order to germinate and destroy weeds, to conserve moisture, and to provide a good seed-bed. In most instances a winter cereal should be grown in the year prior to that in which lucerne is to be sown. When the crop is removed in early summer a long period is available for preparation of the land for lucerne. A fine seed-bed should be available for April or May planting. Should earlier planting be prevented by unfavourable rainfall conditions, sowing may be made up to the end of July with some prospects of securing a good stand.

The rate of sowing of lucerne for grazing purposes is lighter than that employed when the crop is sown for hay purposes, since the large-crowned plants developed in a thin stand are more desirable for grazing purposes than the small-crowned, spindly plants formed in a dense hay stand. The quantity of seed sown per acre varies with the district. Lucerne is a crop with a high water requirement, and the rate of sowing should be adjusted in accordance with the expectation of the amount of soil moisture which will be available during the periods when growth is especially required. On soils with a fairly high water-table in the more favoured dairying and grazing districts a sowing rate of 8 lb. per acre should prove satisfactory; on fairly dry soils in the semi-arid districts 2 lb. per acre usually suffices. Intermediate country will sustain stands seeded at the rate of 4-6 lb. per acre.

The seed may be sown broadcast by hand or by a hand-operated broadcasting machine, or distributed by means of a wheat drill, with or without a special lucerne seed attachment. A light harrow should be employed to cover the seed to a depth of about ½-inch, or it may be tramped in lightly by a mob of sheep.

Experiments to ascertain the value of a nurse crop for lucerne in dry districts are at present being conducted by the Department of Agriculture and Stock.

In areas where there is likely to be a deficiency of phosphates in the soil it is advisable to sow ¾-1 cwt. of superphosphate per acre with the seed.

Management.—Continuous grazing of lucerne is detrimental to the stand, and the pasture should be divided into relatively small paddocks, which may be grazed intermittently when the crop is approaching the flowering stage. The first grazing should not take place until the plants are 9 or 10 inches tall. Two or more cultivations of the area should be made each year to break up the surface soil which has been consolidated by tramping.

Care must be taken to prevent losses of livestock due to bloating, which are likely to occur in stock unaccustomed to lucerne being permitted to feed greedily on succulent young growth.

Feeding Value.—The richness of lucerne in proteins and other nutrients is well known to all stock-raisers. To provide a balanced ration the lucerne should be combined with some carbohydrate-rich food, such as grass.

Pests and Diseases.—A disease known as Witches' Broom, Little-leaf, or Bunchy-top, is fairly common in lucerne stands in dry areas, and no remedy has yet been discovered.

Perennial Lespedeza (*Lespedeza sericea* Mig.).

Origin and Distribution.—Within recent years this species of lespedeza, which is native to the Orient, has been cultivated in the United States of America, but has not yet become an important fodder plant. Seed has been available in Australia for a few years, and trial plantings have been made by numerous persons in New South Wales and Queensland. Local experience to date has shown the plant to have some promise for grazing purposes.

Description.—Perennial lespedeza is a long-lived leguminous plant somewhat similar in habit to lucerne—that is, it is a tufted plant with many tillers, which come away from the crown year after year. It reaches a height of 2-4 ft., and abundant small leaves are produced along the erect stems and their branches.

Climatic Requirements.—The plant is chiefly a summer grower, and requires a moderate summer rainfall for its development. Its drought resistance is inferior to that of lucerne, and the usefulness of the plant probably would be restricted to areas experiencing an average annual rainfall of over 30 inches. It does not appear to be greatly damaged by cold, though the late-maturing seed crop is likely to be affected by early frosts.

Soils.—Perennial lespedeza appears to thrive on a variety of soil types, and is worthy of trial on cultivations for rotation and soil-improvement purposes.

Planting.—Sowing of this legume should be carried out in the spring or early summer. The seed may be drilled in or sown broadcast. If drilled, 4-5 lb. of seed per acre will suffice; broadcast sowings require 10-15 lb. of seed per acre. The seed should be only very lightly covered.

Management.—Experimental grazings have shown that stock, especially sheep, are fond of perennial lespedeza. The natural tendency of the plant is to develop woody stems, and if it is to be used for pasture or hay this tendency must be counteracted by grazing or cutting in the immature stages. The stand should not be subjected to close grazing or cutting, as the regrowth comes not from the crown but from the joints of the stubble.

Conservation.—In the United States, perennial lespedeza is used as a hay crop, the first cutting being made before the stems become woody. Little information is available concerning the feeding value of the hay compared with lucerne hay.

Feeding Value.—The young growth is relished by all classes of stock, and has a feeding value of a high order. Woody material is neglected.

Seed Production.—For seed production perennial lespedeza should be cut when the seed is ripe, cured, and threshed. It is advisable to scarify the seed to permit of easier germination.

SHEEP'S BURNET (*Poterium sanguisorba* L.).

Origin and Distribution.—Sheep's Burnet is a native of Europe and Mediterranean Asia, where it is known as Burnet Poterium, Salad Burnet, and Garden Burnet. It is not extensively cultivated for pasture purposes in any part of the world. In New South Wales and in Southern Queensland it has some value as herbage in mixed pastures.

Description.—The plant belongs to the rose family, and is a tufted perennial with a deep tap root. Much-divided leaves are formed at the crown of the plant, and a dense type of leafy plant results. Towards maturity the plant produces small globular flower heads at the extremities of long flowering stalks. The large angular seeds are brown in colour.

Climatic Requirements.—Whilst Sheep's Burnet is mainly a spring and summer grower it produces a certain amount of green feed during the cooler months, consequently it is most useful where a well-distributed annual rainfall is received. It is, however, able to survive fairly long, dry periods, provided they are not excessively hot. Frosts have little destructive effect on the plant.

Soils.—Sheep's Burnet appears to be able to live on a variety of soil types, but does best on deep loams. It produces quite well, however, on somewhat poor soils.

Planting.—The sowing of Sheep's Burnet in pure stands is not warranted by the general value of the plant, but a small quantity sown in mixtures will add variety to the diet. Three or four pounds of seed per acre are sufficient in mixtures. Commercial seed is usually of good quality.

Management.—Sheep's Burnet withstands heavy grazing, and its inclusion in pasture mixtures involves no modification of intermittent grazing practices. Should the original stand of the plant commence to thin out, seeding might be encouraged.

Feeding Value.—Experience of this plant is somewhat variable in so far as palatability is concerned. At least when growing on poor soils the plant has a somewhat bitter taste, but in mixtures stock keep it grazed down. The plant is not related to the clovers, and has not the high protein content usually associated with leguminous plants. Nevertheless, chemical analyses of the plant in the immature state suggest it to have a fairly high-feeding value.

[TO BE CONTINUED.]

◆

PREPARATION OF SEED-BED FOR PASTURE.

Various types of seed bed, ranging from uncultivated forest land to the onion bed type, are employed for sown pastures. The seed-bed provided by partly cleared forest land, even though some form of harrowing has been carried out, is very unsuitable for pasture establishment, the competition of native grasses and undergrowth usually proving too severe for the seedlings of sown pastures. Likewise, established pastures of native or other grasses are not receptive of additional pasture plants unless a disturbed seed-bed is provided, and a temporary check given to the growth of the established plants, by drastic harrowing. The ashes resulting from scrub burns provide quite a good seed-bed for pasture plants.

By far the best seed-bed is that resulting from the efficient tillage of fertile soil. Most of the common pasture plants have small seeds and require a seed-bed of fine tilth, and by compacting the soil close to the surface a seed-bed is provided which is favourable to the fine, early root systems of the pasture plants. The seed-bed should contain ample moisture, and in dry districts, particularly, cultural operations throughout the seed-bed, preparation period should be carried out with due regard to the conservation of moisture. Ploughing well in advance of sowing is desirable, and the land should be allowed to lie in the rough state for a few weeks before further cultivation is undertaken. Heavy tine harrows, or a spring-tooth cultivator, will be required to break down the clods. Subsequent working should aim at destroying weeds and compacting the sub-surface soil, and shallow harrowings will assist to this end. If the land becomes weedy and the surface sets hard, a disc harrow may have to be used to destroy the weeds. Rolling prior to sowing may be desirable in cases where the ordinary cultivation has not sufficed to form a fine seed-bed.

—*C. W. Winders.*

A New Weed in Tropical Queensland.

W. D. FRANCIS, Assistant Government Botanist.

RECENTLY Dr. L. G. Miles, of the Bureau of Tropical Agriculture, South Johnstone, forwarded a weed for identification and report. He stated that it was growing in a clean area, not grassed, at Japoon. It has attained a considerable spread and, from its seeding habits and vigorous growth, Dr. Miles thinks it has potentialities as a serious pest.

Upon examination, the plant was found to be *Hyptis capitata* Jacq., a native of tropical America. E. D. Merrill, in his "Enumeration of Philippine Plants," Vol. 3, p. 416, remarks that this species is established now in the Marianne and Caroline Islands, Formosa, Java, Amboina, and the Philippine Islands. According to Merrill, it was introduced to the East from Mexico.

The principal features of this species are its opposite, toothed leaves, square stems, and flowers in very dense globular heads which are borne on a long stalk. The more persistent parts of the individual flowers which compose these heads are the bell-shaped or tubular calyx, which is three-eighths to half an inch long, including the five narrow lobes or bristles about one-twelfth of an inch long at the top of the calyx. Within the calyx are four minute nutlets, which are black or dark in colour, and measure less than one-sixteenth of an inch long. Plate 179 illustrates a dried specimen of the plant.

As there are four seeds to each calyx or outer fruit-covering, and numerous calyxes in each seeding head, it is clear that this plant is a very prolific seed-producer.

If the underside of the leaves is examined with a lens, numerous scattered dots can be seen. These dots are small oil glands. They are not confined to this species, but are often found on other plants of the same family (*Labiatæ*). The oil contained in these glands often imparts a peculiar odour to the plants.

◆

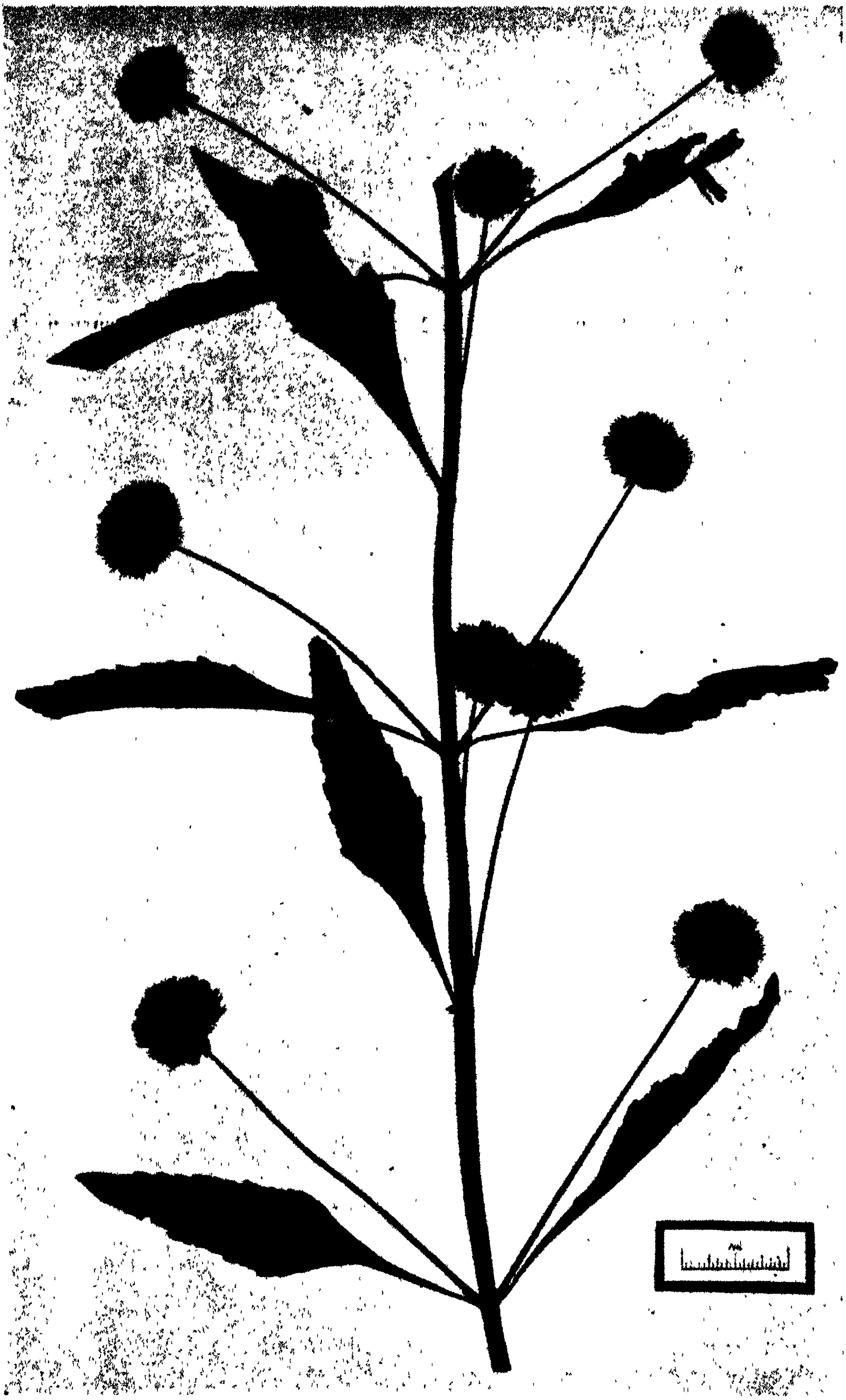
HEXHAM SCENT.

During the past month the Department has received for report a number of specimens of common winter-growing weeds. Among these is the melilot or Hexham scent, a native of Southern Europe, Northern Africa, and Western Asia, but now spread widely as a weed in many warm temperate and sub-tropical countries. As information is always sought about the fodder value of this plant the following notes may be of interest:—

Hexham scent was "boomed" as a fodder in Australia some years ago under the name of King Island Melilot, but experience in Queensland has been that stock do not take very readily to it, and have to become accustomed to its peculiar odour and flavour. It has the great disadvantage of tainting milk and cream rather badly. It is short-lived, being at its best during the spring months, dying-off at the approach of hot weather towards the end of October or early November. As a fodder plant for Queensland during the winter and spring months it is inferior to some of the annual trefoils and clovers—such as the common burr trefoil and cluster clover.

It is a common weed of wheatfields, and if reaped with the wheat and stored for any period the peculiar penetrating odour is communicated to the flour and bread subsequently made. It can be eradicated by ploughing it in, especially in the young stages, when the plant makes a valuable green manure. If cut off near the ground level when it is in flower it will shoot again with numerous short branches, and the cutting will have to be done several times before the root is exhausted. The best time to cut is at the end of the flowering season, just before the seed ripens. In smaller areas hand-pulling or chipping or digging out the weed will prove effective.

—*C. T. White.*



[*Photo. Dept. Agriculture and Stock.*

Plate 179.

Hyptis capitata, a new weed in tropical Queensland. The inset scale measures 1 inch. The photograph is from a dried specimen.

Neutralisation of Cream.

L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

CREAM obtained from freshly-drawn milk has an acidity of about 0.12 per cent. Such cream can be pasteurised without neutralisation, as there is no danger of coagulation when it is heated. This is done in certain countries where daily deliveries are made to the factories, notable examples being New Zealand and Denmark.

In New Zealand the pasteurised "sweet" cream is churned as such. In Denmark and certain other countries, where the butter reaches the consumer in a comparatively short time, a certain degree of acidity is developed subsequently under carefully controlled conditions before the churning is done.

Where cream deliveries are less frequent the acidity of the cream is seldom less than 0.25 per cent., the actual percentage of acidity depending upon the conditions under which the cream is produced, stored, and transported.

Objects of Neutralisation.

Sour cream cannot be pasteurised satisfactorily, as heating would cause curdling at once. The acidity first must be reduced to a point at which pasteurisation can be accomplished with safety. This process is termed neutralisation, and consists of adding a calculated quantity of a suitable alkali to the cream. Other objects of neutralisation are to avoid the fat losses due to coagulation of the casein on heating, to prevent undesirable flavours resulting from the heating of sour cream, to assist in the removal of objectionable volatile odours, and to improve the keeping quality of the resultant butter.

Choice of Acidity Standard.

The percentage of acidity to remain in the cream after neutralisation is decided by the factory manager, and varies from 0·05 to 0·25 per cent. The average appears to be about 0.12 per cent. for choice cream, which is approximately that of the freshly separated cream. It generally is a good policy to aim at a higher residual acidity in lower grade cream, as the acidity test applied to such creams generally indicates more than the true acidity owing to the presence of carbon dioxide. Neutralising such cream to a low degree of acidity therefore could result in over-neutralised or alkaline cream.

The important point in neutralisation is to select definite standards of residual acidity for each grade of cream; and to adhere as closely as possible to those standards until good cause for an alteration is shown.

Accuracy is Required.

Accurate neutralisation depends upon the following factors:—

1. The taking of an accurate sample for the acidity test.
2. The performance of an accurate acidity test.
3. An accurate knowledge of the amount of cream to be neutralised.
4. The accurate weighing of the calculated quantity of the chosen neutraliser.
5. The intimate mixing of the neutraliser with the cream before pasteurisation is attempted.
6. The performance of regular check tests on the neutralised and pasteurised cream.

Taking an Accurate Sample.

This is the most important part of any chemical test as *an analysis can be only as accurate as the sample.* It cannot be emphasised too strongly that the sample taken must be representative of the whole of the cream awaiting neutralisation. It definitely is wrong to take the sample before all the cream has been poured into the vat, before the cream has been diluted or standardised, or before the contents of the vat have been mixed thoroughly. The cream should be preheated to a temperature of 90 degrees to 95 Fahr. in order to emulsify the thick cream thoroughly. A discussion of the standardisation of cream will be found later in this article.

Making an Accurate Acidity Test.

The conditions for accurate acidity tests were given in a previous article ("Queensland Agricultural Journal," June, 1937, Vol. 47, pp. 557-562), and for that reason no detailed discussion here is needed.

Measuring the Cream.

For very accurate work it is necessary to know the weight of cream to be neutralised, but this is not usual in practice. An estimation is made by measuring the volume in gallons and assuming that one gallon of cream weighs 10 lb. Strictly speaking, this is not correct, as a gallon of cream weighs a little less than 10 lb., and the weight of cream is therefore over-estimated. This is one reason why it is usual to find that the reduction of acidity has been slightly more than that desired.

To minimise errors each vat should be provided with a dip stick, which is graduated for that particular vat only. It is only by such means that reasonably accurate neutralisation is possible.

Neutralising Compounds.

A large number of alkaline compounds have been used at various times for the purpose of neutralising cream. Among the more common are sodium bicarbonate, sodium sesquicarbonate, modified sodas, soda ash, lime, calcium carbonate, magnesia, and magnesium carbonate. A number of these are much less suitable than others, and will not be considered.

Sodium Bicarbonate, $NaHCO_3$, is a definite chemical compound, and is obtainable in a high state of purity at a comparatively low cost. It does not absorb water readily from the atmosphere, and is non-caustic. Only when used in excess and subjected to prolonged high heating is there any danger of saponification of fat and excessive fat losses in buttermilk. Its only disadvantage is the large amount of carbon dioxide liberated during neutralisation. Its good qualities, however, have made it the most popular neutralising alkali. One part of lactic acid is neutralised by 0.933 parts of sodium bicarbonate.

Modified Sodas are essentially mixtures of sodium bicarbonate and sodium carbonate. They may be mechanical mixtures of the two compounds in definite proportions, or may be definite crystalline compounds formed by crystallisation of a solution which contains both bicarbonate and carbonate. They also are known as "neutral sodas," which definitely is a misnomer. They are somewhat caustic owing to the sodium carbonate which they contain. Because of this, care must be taken to avoid over-neutralisation in order to prevent saponification of fat. When compared with sodium bicarbonate, there is no justification for claiming a reduction of fat losses, as they have the disadvantages of sodium carbonate in a modified degree. They, however, liberate less carbon dioxide than bicarbonate, and therefore cause less frothing. Each of these mixtures has its own degree of alkalinity, depending on the relative proportions of bicarbonate and carbonate, and hence are usually accompanied by special neutralising instructions or charts. They also find a wide use as cleansers.

Sodium Sesquicarbonate, $NaHCO_3$, Na_2CO_3, $2H_2O$, is really one of the modified sodas, but is a definite chemical compound, which does not absorb or lose water or carbon dioxide on exposure to the atmosphere. It is found, naturally, as the mineral Trona in an impure state; but can be manufactured in a high state of purity at a reasonable cost. The amount of carbon dioxide evolved is only two-thirds ($\frac{2}{3}$) of that evolved by sodium bicarbonate. One part of lactic acid is neutralised by 0·837 parts of sodium sesquicarbonate; nine parts being equivalent to ten parts of sodium bicarbonate.

Sodium carbonate is obtainable in a number of different forms.

Soda ash, Na_2CO_3, is anhydrous sodium carbonate, which readily absorbs both water and carbon dioxide from the atmosphere.

Crystal soda or crystal carbonate, Na_2CO_3, H_2O, is a monohydrate of sodium carbonate, which is more stable than soda ash, but which, nevertheless, absorbs both water and carbon dioxide.

Sal soda or washing soda, Na_2CO_3, $10H_2O$, is the decahydrate of sodium carbonate, and loses water, but absorbs carbon dioxide on exposure. This usually is less pure than the other two forms.

Sodium carbonate is distinctly caustic and, while not considered a suitable neutraliser, it finds wide application as a cleanser.

Lime is used to some extent, particularly for highly acid cream. It usually is used as milk of lime (calcium hydrate), and does not cause frothing. The use of lime is much more difficult than the soda compounds, as the strength and quality of lime varies widely, and each batch of milk of lime made up must therefore be tested to determine its neutralising power and must be kept perfectly mixed until it is required no longer. As it is seldom, if ever, used in Queensland it need not be further discussed here.

Calculating the Weight of Neutraliser Required.

A neutralising chart for the use of sodium bicarbonate, giving the weight of bicarbonate required to neutralise from 1,000 to 5,000 lb. of cream by 0.02 to 0.84 per cent. of acidity has been published by the Department of Agriculture and Stock, and is available for distribution to butter factories. If the demand for sodium sesquicarbonate is sufficient, a similar chart for that neutraliser will be prepared. Commercial firms, particularly those selling modified sodas, also issue neutralistion charts for the neutralisers which they sell.

As the charts are liable to become damaged or destroyed it is essential that the operative performing the neutralising should be able to calculate the weight of neutraliser required.

This depends entirely upon the weight of lactic acid which is to neutralised. This can only be obtained from an accurate knowledge of the amount of cream and the acidity percentage. It is best explainable in stages—

(*a*) Calculate the percentage of acidity reduction required by subtracting the desired acidity from the actual acidity percentage.

(*b*) Calculate the weight of lactic acid to be neutralised by multiplying the weight of cream by the percentage of acidity reduction required and dividing by 100.

(*c*) Calculate the weight of neutraliser required by multiplying the weight of lactic acid to be neutralised by the parts of the neutraliser required to neutralise one part of lactic acid.

Example—

3,000 lb. of cream containing 0.40 per cent. acidity is required to be neutralised by sodium bicarbonate to 0.12 per cent. (1 part of lactic acid is neutralised by 0.933 parts of sodium bicarbonate).

(*a*) Percentage of acidity reduction required $=0.40-0.12=0.28$ per cent.

(*b*) Weight of lactic acid to be neutralised $= \frac{3.000 \times 0{\cdot}28}{100} = 8{\cdot}4$ lb.

(*c*) Weight of bicarbonate required $= 8.4 \times 0.933 = 7.84$ lb. or 7 lb. 13½ oz.

If sodium sesquicarbonate is to be used for neutralisation the calculation would be the same for the first two steps; but the third step would be as follows:—(1 part of lactic acid is neutralised by 0.837 parts of sodium sesquicarbonate).

(*c*) Weight of sesquicarbonate = 8.4 x 0.837 = 7.03 lb.
or 7 lb. 0½ oz.

In practice there is no necessity to work out each stage as shown above. The last two stages are combined into one equation.

$$\text{Weight of neutraliser required in lb.} = \frac{\text{Acidity reduction required} \times \text{Weight of cream in lb.} \times \text{Parts of neutraliser required to neutralise 1 part of lactic acid}}{100}$$

Applied to the above figures the equation becomes

$$\text{Weight of sodium bicarbonate required} = \frac{0{\cdot}28 \times 3000 \times 0{\cdot}933}{100} = 7{\cdot}84 \text{ lb.}$$

or

$$\text{Weight of sodium sesquicarbonate required} = \frac{0{\cdot}28 \times 3000 \times 0{\cdot}837}{100} = 7{\cdot}03 \text{ lb.}$$

The quantity of neutraliser having been calculated, it should be weighed out as accurately as possible. The days of guesswork passed with the practice of neutralising to low acidities, owing to the danger of over-neutralisation.

Mixing the Neutraliser With the Cream.

Having weighed out the required amount of neutraliser, it should be dissolved completely in water, as in this way it is more quickly and evenly distributed throughout the cream. The quantity of water recommended is 2 gallons for each pound of neutraliser.

There are various ways in which the solution of neutraliser may be added, ranging from very crude manual to modern mechanical methods. It should not be mixed in a cream can and dumped bodily into the cream, as this over-neutralises the cream where the neutraliser is added. A water can is sometimes used, and is much better than a cream can. More modern methods consist of spraying the solution into the cream by means of a steam injector, by allowing it to flow from a vessel some height above the vat or by pumping. A recent introduction is a machine which adds a standard strength neutraliser solution at a predetermined rate to the cream as it flows to the pasteuriser. This machine depends for its successful use on the flow of cream being constant throughout the whole pasteurising process. This is not easy of attainment with some pasteurisers, as, after use for some time, the deposit on the pasteuriser interferes with the flow of cream, and over-neutralisation may result. If this machine is being used, frequent acidity tests on the cream from the coolers should be made to see that the neutralisation is being done accurately.

The temperature of the cream when the neutraliser is added should be 90 deg. to 95 deg. Fahr., and it should be kept constantly agitated during the addition, and for some time before pasteurisation is attempted, twenty minutes being a satisfactory period. Unless this time is allowed, the acidity of the cream will not have been reduced sufficiently for efficient pasteurisation.

Performing Check Tests for Acidity.

This is a part of factory routine which frequently is omitted. Check tests on the cream from the coolers is of great value, because it gives the operator immediate information on the accuracy of neutralisation. The butter maker should perform check acidity tests on the cream daily before churning, as this will not only be a check on the accuracy of the neutralisation, but will be of value in deciding the acidity required for the best grading results for each grade of cream. It is dangerous to take everything for granted, and as there are so many factors controlling accurate neutralisation, such check tests serve the purpose of maintaining the keenness of the operator responsible for neutralisation.

Neutralising Standardised Cream.

Cream standardisation, which is merely a process of dilution to a standard percentage of fat, is of value in reducing processed flavours and in controlling the composition of butter. It sometimes is wrongly done after the acidity test has been performed, and difficulty is experienced in obtaining the percentage of residual acidity desired. The addition of water not only reduces the percentage of fat, but also reduces the percentage of acidity, although the weight of fat and acid remains the same. Take for example the following case:—

Weight of cream	3,000 lb.
Fat	40 per cent.
Acidity	0·40 per cent.
Weight of lactic acid	12 lb.
Desired acidity	0.12 per cent.
Acidity reduction required	0.28 per cent.
Lactic acid to be neutralised . ..	8 lb. 6½ oz.
Bicarbonate required	7 lb. 13½ oz.
Weight of residual acid	3 lb. 9½ oz.

If, however, sufficient water is added to reduce the fat to 30 per cent., the figures are as follows:—

Weight of standardised cream	4,000 lb.
Fat	30 per cent.
Acidity	0·30 per cent.
Weight of lactic acid	12 lb.
Desired acidity	0·12 per cent.
Acidity reduction required	0·18 per cent.
Lactic acid to be neutralised	7 lb. 3 oz.
Bicarbonate required	6 lb. 11 oz.
Weight of residual lactic acid	4 lb. 13 oz.

It, however, should be emphasised that when standardisation of cream is performed the acidity desired should be lowered by the proportion of added water.

In the case quoted there was 1,000 lb. of added water in 4,000 lb. of standardised cream, the proportion of added water therefore being 1 in 4 or ¼. The desired acidity should be reduced by ¼ of 0·12—that is, by 0·03 per cent. The acidity aimed at in the standardised cream should therefore be 0·12 – 0·03 = 0·09 per cent. The essential figures then would be—

Desired acidity	0·09 per cent.
Acidity reduction required	0·21 per cent.
Lactic acid to be neutralised	8 lb. 6½ oz.
Bicarbonate required	7 lb. 13½ oz.
Weight of residual acid	3 lb. 9½ oz.

It will be noticed that by this method the weight of lactic acid to be neutralised, bicarbonate required, and residual lactic acid is the same as in the non-standardised cream, but that the percentage of residual acidity is lower. It therefore is essential to proceed as follows in order to obtain check tests comparable with the acidity desired:—

1 Standardise the cream to the desired fat percentage and mix thoroughly.

2. Take the sample and perform the acidity test.

3 Aim at a lower residual acidity than is the case when no standardisation is made

4 Calculate the weight of neutraliser required on the weight and acidity percentage of the standardised cream

LUNG WORMS IN CATTLE AND SHEEP.

Lung worms in cattle and sheep may become serious during the late winter and spring months. As a rule only the young animals are affected and lung worms should be suspected in any animal showing loss of condition, accompanied by spasms of coughing, signs of suffocation, and scouring. Such symptoms may also be shown by animals which are suffering from a disease of the lungs brought about by some cause other than lung worms. In calves, for example, there is a type of pneumonia caused by bacteria, in which the symptoms are very similar to those associated with lung worm infestation. As the pneumonia due to lung worm infestation and that caused by the bacteria require entirely different treatments, it is always wise to kill an animal in which the disease is far advanced, and examine the lungs. If lung worms are present they will be seen readily, as they occur in bunches in the air tubes of the lungs surrounded by a blood-stained froth.

If the diagnosis is confirmed, the remainder of the animals affected with lung worms should be removed immediately to warm dry quarters and drenched in order to remove other species of worms which might be present in the stomach. This procedure, whilst it does not affect the lung worms directly, increases the animal's resistance to them. Infested animals should be given a good supply of nourishing food, which also assists in building up the animal's strength.

In very severe cases an injection of certain drugs can be made through the windpipe to expel the worms. This operation is not without risk, and in cases where an injection is desirable the assistance of the local stock inspector should be sought.

Further details regarding the drugs to be used for drenching and for injection into the windpipe may be had on application to the Animal Health Station, Yeerongpilly.

—*Dr. F. H. S. Roberts.*

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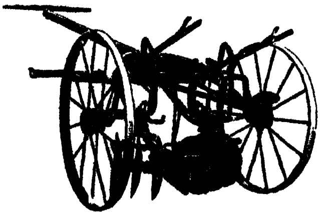

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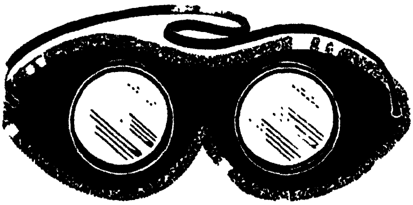

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Herd Testing and Profits.

L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

THE problem facing all dairymen is how to produce the maximum amount of butterfat at the lowest possible cost, while at the same time maintaining, or improving, the fertility and carrying capacity of the pasture and health of the stock. On the farmer rests the responsibility for efficient pasture management; and on the stock that of producing the maximum amount of fat from the food consumed.

All thoughtful farmers must admit that good cows are essential to success. Many claim that they have good cows, and base their claim on factory returns. This, however, is only evidence that the herd as a whole is good, and not that each individual member of it is producing enough fat to pay its way.

A drop in factory returns is unexplainable to such farmers, and they are in a quandary as to where the remedy lies. The farmer who submits his herd regularly to testing can see, by comparing the production records of mothers and daughters, whether the production is being maintained, whether the right cows are being used for breeding, and whether the herd sire is producing profitable or unprofitable daughters. By these means he is able to remedy any possible fault before it affects his factory returns to any noticeable extent.

The productive ability of a cow can be ascertained only by testing. The figures obtained indicate her ability as a producer, under the existing feeding and management conditions, which are controlled by the weather and the farmer. There is ample evidence available to show that the average herd contains animals which do not produce sufficient fat to pay for the food which they consume.

Herd testing is essentially educational. The figures merely disclose the facts, and the responsibility is upon the farmer to carry out the necessary remedies. A farmer who neglects to cull unprofitable animals has only himself to blame if production is stationary or shows a decrease. Failure to act on the part of the farmer cannot be construed, by any means, as a failure of the system of herd testing.

An actual case of well-applied herd testing is as follows:—

Season 1932-33.—A herd of thirty-four cows averaged 194 lb. of fat, total 6,596 lb. At the end of the season no fewer than twenty-six animals were culled.

Season 1933-34.—The herd, reduced to thirty-one members (eight cows retained from previous season, plus five tested pedigree cows and eighteen springers from tested cows), averaged 307 lb. of fat, total 9,517 lb.

Season 1934-35.—The thirty-one cows averaged 340 lb. of fat, total 10,540 lb.

In this case the actual production from the same grazing area rose from 6,596 lb. to 10,540 lb. of fat. The fat per acre thus was nearly doubled, and, with fat at 1s. a lb., the income rose from £330 to £527.

Herd testing will pay handsome dividends, provided that the farmer does his share.

Improving Cream Quality.

J. S. OGILVIE, Dairy Instructor.

ONE point that should be brought home to factory suppliers is that the men supplying inferior cream are taking money actually out of the pockets of the whole of the suppliers, since all inferior cream must have its effect either on butter quality or market conditions. Even if their cream be classed first or second grade, the deduction made by the factory is not adequate always to cover the loss incurred by the extra time and labour which are necessary when the cream has to be treated separately.

In the majority of cases the production of low-grade cream is due to general carelessness in the washing and scalding of dairy utensils, including milking machines—usually exemplified by a quick, cold water wash at night—to the practice of leaving the skim milk alongside the dairy, failure to remove manure from the yards or surroundings, and to untidy conditions generally. Probably 90 per cent. of the inferior cream is due to the causes stated, and the other 10 per cent. is associated with lack of care for the cream after it is separated—such as mixing hot and cold cream, and neglecting to stir the cream regularly, together with seasonal conditions and factors, such as bad water, food, and weed taints.

During the months of November, December, January and February, owing to the extremely humid conditions which characterise most of the dairying districts of Queensland, bacterial development is so rapid that, in order to supply the choicest quality cream, great care is essential. The dairyman's best insurance against the development of an inferior quality is the rapid cooling of the cream below optimum point as a means of retarding bacterial development—that is, to about 70 deg. Fahr., or lower if possible—and the daily delivery of all cream to the factory for manufacture into butter. Under existing climatic conditions, temperature plays such an important part in cream condition that every degree the temperature of the cream can be lowered is an advantage. In this connection it is essential that the cream cooler should be used and that a cream storage room, large enough, and so ventilated as to maintain as low a temperature as possible at all times, should be provided Many dairies in Queensland fall far short of the ideal, being no more than boxes, and showing (in extreme cases) a temperature inside as high at 115 deg. Fahr. on a hot day. This temperature, maintained for any length of time, could not fail to cause the best cream to deteriorate rapidly.

A large number of yeasty, fermented and other creams with objectionable odours, have been traced to contamination from insanitary pigsties, dirty dairy buildings, and surroundings, skim milk flumes, and skim milk casks outside the buildings which, as often as not, are in an insanitary condition. The use of wooden casks for the storage of skim milk cannot be condemned too strongly. They should be replaced by galvanised iron tanks on a cement floor, as these are cleansed most easily and efficiently after each separation. Under conditions where gravity can be utilised, the use of wide open flumes to carry the milk to the pig pens is much the better method; these, of course, should always be kept clean.

Many dairymen fail to understand what constitutes boiling water. As long as it is "pretty hot" they consider it will do, not worrying about the fact that its temperature is too low to give it germ-killing efficiency. Often, too, there is an inadequate supply of boiling water, due mainly to only one kerosene tin of water having been prepared, which is part mixed with cold water for washing purposes, the balance being used for sterilisation and drying. Inadequate provision also is made for boiling the water. A set-in boiler should be installed. A copper will be found to be more economical in the long run.

Where conditions allow, a direct water supply should be drawn from a tank attached to the dairy house or some other clean source; avoiding, if possible, the use of the milking shed roof as a catchment area, this being a potential source of contamination. Many dairymen consider that one such tank provides an adequate supply of water for dairy purposes all the year round, and make no provision against dry spells. When a dry spell comes, they cart water from creeks and waterholes, often only a few hundred yards distant. Frequently, however, it would be possible, with the expenditure of a few pounds for a pump or windmill, to obtain an ample supply of good fresh water for all purposes for such permanent sources as wells and running streams. The dairy tank should be well protected against the invasion of frogs, birds' droppings, &c.

The dairyman, forgetting that milk and its products are most perishable, too often leaves the washing up of utensils and the care of cream to children or employees, over whose operations he exercises very little or no effective control.

Supplied with the separator is either a tin tube or galvanised iron wire to keep the separator discs together. This leads only to a general swilling of the discs in the water and not the careful washing of each part separately. The result is that the discs are generally left in a greasy, unhygienic state. To ensure thorough cleaning, they should be washed separately and scalded after each separation, and aired in a clean, dry place.

Numerous cases of second-grade cream arise from the use of milking machines, and are due often to infection from the vacuum line, where the old-style plants are in use. These have a large vacuum tank and line, which are very hard to dismantle and clean, and, more often than not, are not cleansed at all. Under such conditions farmers are advised to install the latest type vacuum line and tank. The high price of rubber inflations and tubes causes the dairyman to use them as long as possible, and this fact is responsible for most of his machine taint trouble. Only when he is shown how the rubbers affect the quality does he see the necessity for replacing these. The frequent replacing of these parts usually results in the production of a higher grade cream which offsets easily the money expended.

The inspector, on visiting the dairy, explains his mission, and asks for, and in practically every instance receives, the dairyman's co-operation. Demonstrating with means to hand, he explains how milk and cream can be deteriorated by the hands of the milker, udder and teats of cows, manures, utensils, and general surroundings, and also when awaiting delivery to the factory. In illustrating these points, and tracing the cause of low-grade cream, the Government Dairy Research Laboratory is proving of great value. Generally speaking, by far the worst cream received at factories comes from dairies where milking machines are in use, and this seems to be due to a want of knowledge, lack of proper care of such machines, and the failure to appreciate the fact that the bacteria associated with milking machines are of a very virulent and active type, which, on entry to the milk during its passage through the machines, are in an actively growing state, particularly where rubbers are kept in plain water. Under ordinary hand-milking conditions these particular bacteria would take twelve or more hours to reach the stage of development that two or three hours would produce in machine cream.

Desirable Conditions.

The percentage of second-grade cream in most Queensland dairying districts would be reduced to a negligible quantity if the following conditions could be fulfilled:—

1. All tin ware, including cream cans, must be tinned thoroughly and have a smooth surface.

2. All utensils, including cream cans, must be sterilised thoroughly with boiling water and cooled before use.

3. A good, clean, pure water supply should be ensured by the use of tanks, windmills, and pumps. As water is an important adjunct, the farmer who has a water supply laid on to the milking shed and dairy conveniently served with taps will be repaid amply for the little extra expense. It must be pointed out, however, that the roof of the milking shed should not be used as a catchment area for water for dairy purposes, owing to the danger of contamination by dust from the yards. Where any doubt exists as to the purity of the water supply, it should be boiled before being used.

4. Ample facilities for boiling water, such as those afforded by a set-in boiler, should be provided as required by the Dairy Produce Acts.

5. The general use, firstly, of cold water for rinsing; secondly, of warm water and washing soda for the first washing; thirdly, of boiling water for proper scalding; and, finally, the draining of all dairy tinware, and the cleaning of the milking plant, should be regarded as essential. Cloths never should be used to dry the inside of dairy utensils. If boiling water is used, they will dry of their own accord, and should be allowed to cool before being used again.

6. Dairymen should have a better general knowledge of milking plants, especially in regard to their cleaning and handling.

7. The use of any utensil, or separator part, whilst it is in a warm state, caused by the sun or hot water, should be avoided.

8. The practice of cooling the cream to as low a temperature as possible; keeping it in cool, clean, well ventilated surroundings, and stirring it frequently and mixing when cool, should be adhered to. Cream should never be allowed to stand in the sun.

9. All cream from dairy to factory should be delivered daily.

Difficult Parturition.

At this time of year, cases of difficult calving are fairly common, and a few hints as to what to do and what not to do may be of value.

When calving becomes imminent, the cow leaves the herd and seeks a quiet spot. There she will become restless—getting up and lying down—and show evident signs of pain.

As labour advances the back is arched, the hindquarters are drooped, and straining becomes violent and continuous. Meanwhile blood may appear on the vulva and tail, and the waterbags protrude between the lips of the vulva. They increase rapidly and the feet of the calf may be seen within them.

The waterbags furnish a soft uniform pressure for the preliminary distention of the womb and passages, and prepare the way for the delivery of the calf. In normal presentations, it is wrong to break these bags prematurely.

When the cow calves standing up, the navel string breaks when the calf falls to the ground; but, when she calves lying down, the string is broken when she rises. A few hours after calving normally, afterpains commence and the placenta or afterbirth is expelled. If this is not expelled within twenty-four hours, it should be removed by careful traction. A good method is to take two sticks about 2 feet long, between which the end of the afterbirth is grasped, and rotated around them until close to the vulva, when gentle traction is applied, from side to side, and backwards and downwards, care being taken not to break it. A vaginal douche of boiled water at blood heat, to which has been added a mild antiseptic, should be given. A cheap and efficient outfit for this purposes consists of about 4 feet of ½-inch rubber hose and an ordinary funnel. The end of the hose should have its edge pared off with a sharp knife, and, after having been smeared with carbolic vaseline, it is introduced into the vagina, and gently pressed forward as far as the womb. The funnel is then placed in the other end of the hose and held above the cow's back, the douche being poured into it.

It is well, at all times, to allow nature to do its work without interference; but, when calving is protracted, and progress is not being made, a careful examination is necessary.

The operator should wear a clean sleeveless shirt, and his arm should be smeared with carbolised vaseline, or an antiseptic oil. This protects the arm from poisoning and the cow from the introduction of infective material into the passage.

The hand should now be introduced into the vagina and a careful examination made. It may be found that (1) the water bags have burst, and that neither the feet nor head of the calf are presented, or that there is a presentation of (2) one fore foot and head; (3) both fore feet, and head back; (4) head with both fore feet back; (5) one hind foot without the other; or (6) other abnormal presentation.

Whatever part is presented should first be secured by a rope with running noose, so that it will not be lost during subsequent manipulation, and may be readily brought into position when the missing parts are found. If the cow is standing, her head should be turned downhill so that the fœtus, and abdominal organs, lie forward to give more room to bring up the missing head or limb. If lying down, she should be turned over on to the side opposite to that on which the limb is missing. When the missing part is located, no attempt should be made to bring it up during a labour pain, but after the pain has ceased an effort should be made to secure it before the next pain comes on.

If pains are continuous and violent, they may be checked by putting a tight surcingle round the body in front of the udder. If it is found that the passages are dry, pure olive oil may be run into the womb through a rubber tube. If the head is back, the limbs which are presented should be first secured with a rope having a running noose, then the fœtus should be pushed as far back as possible and an attempt made to secure the head with a noose or hook, and to bring it up into the passage. Having brought the limbs and head into a suitable position, traction should now be applied in a downward and backward direction, but only when the cow is straining.

Pulling when the cow is not straining should not be attempted. Patience and care are necessary. The practice of attaching a draught horse or motor car to the fœtus and pulling it out by sheer force is not only cruel, but usually results in the death of both the cow and the calf. After a protracted calving the cow will be exhausted, and she should be provided with a warm rug and bed, also a few bottles of warm gruel.

Points to remember are:—

Do not interfere too soon.

When interference is necessary, exercise patience and take time.

Do not use force until the fore feet and head or the hind feet are secured in position.

Remember to pull only when the cow is straining.

—*W. Dixon, Stock Branch.*

RED-WORMS IN HORSES.

Red-worm disease is one of the most serious diseases of horses in Queensland. The disease is caused by the presence of large numbers of red-worms, which inhabit the first part of the large bowel. Those worms vary in size from about ½ inch to 1¼ inches in length and, in a freshly-killed carcase, may be found adhering to the membrane on the inside of the bowel. Their reddish colour is due to the fact that the worms suck blood.

If the worms are numerous, the infested animal does not thrive well, the coat becomes rough, and loss of condition and weakness follow. Diarrhœa is frequently present, and in severe cases the blood becomes thin, the eyes become sunken, the whole appearance of the animal becomes very dejected, and finally death may supervene. The symptoms are gradual in their onset, and the disease may thus be in an advanced stage before it attracts the attention of the owner.

The worms do not multiply within the bowel, and each one of the many thousands that may be present has been picked up as a young worm from the pastures. These young worms in the pastures have arisen from worm eggs which have been passed from the body of the horse in the dung. As these young forms may live among the grass as long as four years, a paddock on which horses are permanently grazed may become heavily infested.

The most efficient drug for the treatment of red-worm disease is oil of chenopodium, which may be most easily administered, after mixing with raw linseed oil, by means of a bottle or a drenching bit. The animal to be treated should be starved for thirty-six hours before, and for four hours after the administration of the drug. The oil of chenopodium is given at the rate of 1½ drams for every 250 lb. live weight in 1 to 2 pints of raw linseed oil. Oil of chenopodium is a highly poisonous drug, and those wishing to use this treatment are advised to get in touch beforehand with the Animal Health Station, Yeerongpilly. In areas possessing a high rainfall, three or four treatments should be given during the year.

In addition to treatment, an attempt should be made to prevent reinfestation. For this purpose, it would be better not to graze horses continually in a single paddock, particularly if it is swampy. Attention should be given to the regular collection of manure from stables and yards. Heavy stocking is not to be recommended, and young horses (up to three years) should, if possible, be kept away from pastures that have been much grazed by horses.

—*Dr. F. H. S. Roberts.*

Winning Pig Exhibits.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

KEEN rivalry, a fine progressive spirit, and a marked all-round betterment in type and conformation of the breeding stock shown, were the outstanding features of the 1937 exhibition of stud and commercial pigs at the Brisbane Show.

In most of the classes there was a sufficient number of good animals to give the judges plenty of variety, and some stock of really excellent quality were paraded.

The pens of recently imported pigs (Berkshires and Middle Whites), the property of the Department of Agriculture and Stock, and, for the purpose of comparison, the Canadian Berkshire boar, the property of the Department of Public Instruction, added interest to the show.

PRIZE-WINNING STOCK.

Berkshires always are the centre of interest to those favouring this British breed, for it is well known that they have an adaptability to farm conditions, and can be used for cross-breeding for both the local and export markets.

The champion Berkshire boar, Woodbine Lentonius 5th, shown by Wide Bay Stud Piggery, Gympie, is of the long, roomy, deep-bodied type, full of quality. He is a son of that remarkable sow Lenton Patience (imp.) purchased in England several years ago by Mr. F. Bach, of Oakey.

The Queensland Agricultural College was awarded second prize in the over two year boar class, with Grafton Jock. A variation in type was noted in the much more compact reserve champion boar Kapleton Supreme, shown by O. L. Klein. He won in a class of six in which Goodna Hospital secured the additional award.

The younger boars were of excellent type, and included many prize winners.

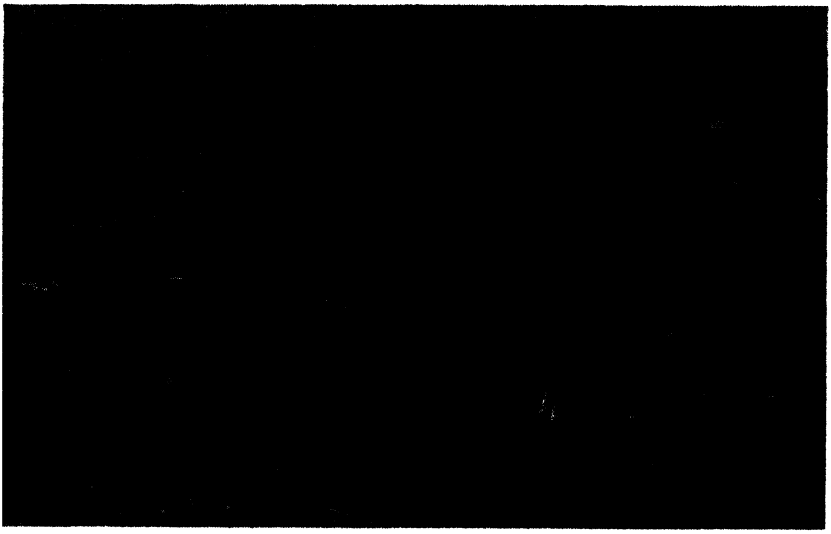

Plate 180.

Berkshire Sow and Litter, second prize winning group. The sow, "Wide Bay Zella," won reserve championship. The litter, thirteen in number, were lucky in that all travelled safely from Rockhampton and were in good order at completion of Show.

Championship in the female classes went to F. Bach with Bonvale Jewel 2nd, sired by Woodbine Lentonius. A Wide Bay Stud exhibit won the second prize, and M. Porter and Sons gained third award with Roselock Queen.

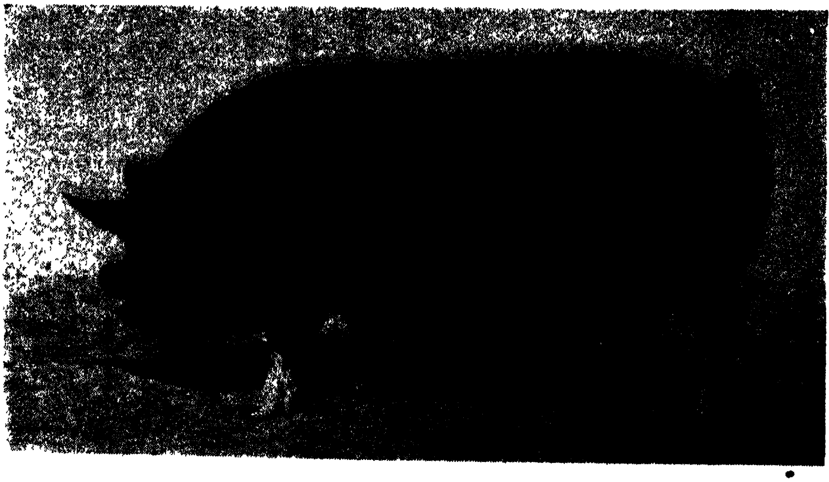

Plate 181.

Reserve Champion Berkshire Sow, "Wide Bay Zella," shown by Mr. A. W. Hodgkinson, of Rockhampton. She is the mother of litter shown in Plate 180.

The reserve champion sow, Wide Bay Zella, shown by A. W. (Jerry) Hodgkinson, with her litter of thirteen, was a winner also in the class for sow and litter in which F. Bach, with Woodbine Amelia and litter, won first award. There were very liberal entries in most of the younger classes, no fewer than sixteen sows being penned in class five months old and under eleven months, and twenty-two in class under five months of age. F. Bach with Thicket Baron 2nd won the boar and progeny prize, and O. L. Klein the breeders' group.

As in the other stud classes, special sashes were presented to the champion winners in each breed by the Australian Stud Pig Breeders' Society, and special ribbons and reserve rosettes by the Royal National Association.

The silver medal presented by the National Pig Breeders' Association of England was awarded to F. Bach's champion sow.

LARGE WHITES.

The total entry of Large Whites was not up to previous years' standard and there was considerable variation of type, nevertheless some excellent quality animals were penned. Some of the senior animals were much too fat and were inclined to be heavy boned in comparison with those selected for premier awards. The champion boar, A. G. Wallace's St. Cloud Bradbury 3rd, was selected from the class under seventeen months of age in which the Queensland Agricultural College had the second award with Gatton Samson 55th. Similarly, the reserve champion came from the class under eleven months, in which J. A. Heading, with Highfields Hardshot 7th, was the successful winner. Mittadale Stud Piggery won second award with Mittadale Sam, and A. G. Wallace third, with Rose Mount Chief. Mr. Wallace won first award in class over two years old with Rose Mount Bradbury 3rd, and J A. Heading second with Gatton David. Mr. Heading and W. H. Mumford won the awards in the class over seventeen months and under twenty-four months in each with boars of "Highfields" production.

Plate 182.

First prize Light Baconers. Exhibited by Mr. M. G. Bayliss, of Maleny, a choice quality lot of Large Whites, in ideal condition for factory requirements.

The Large White sow, Staghorn Belle, shown with a large, thrifty litter, by A. G. Wallace, a New South Wales exhibitor, attracted considerable attention, and was a centre of interest throughout show week.

In the female classes, the champion sow was Highfields Pear 29th, shown by M. G. Bayliss. She also secured the special medal presented by National Pig Breeders' Association. The second prize was allotted to Mr. Wallace's Staghorn Belle, which also was shown in the sow and and litter class.

The reserve champion sow was J. A. Heading's Highfields Peg 13th, sired by the former champion Gatton David There were many fine-quality sows in the younger classes.

The boar and progeny prize went to Gatton David and his progeny, shown by Mr. Heading, who was also awarded the trophy for the breeders' group.

MIDDLE WHITES.

In the Middle White male classes the Salvation Army Training Farm, at Riverview, secured the championship with Armagh Hero 1st, a competitor in the class in which H. O. Rees secured second award.

A new exhibitor, J. H. Teague, gained first award with Turo Hivite in the class for boars over seventeen and under twenty-four months. One of T. M. Wallace's boars was placed also in the same class.

Plate 183.

Mr. J. H. Teague's Champion Middle White Sow, "Turo Boronia 2nd," who secured for her owner a coveted award on the occasion of his first penning an exhibit at the Royal National.

The reserve champion boar was T. M. Wallace's Armagh Peer 3rd. The champion sow was J. H. Teague's Turo Boronia 2nd, the reserve being Gladesville Blossom shown by T. M. Wallace.

The Middle White breed in Queensland has improved greatly in recent years, and it is hoped that the importation of unrelated strains, and the distribution of the progeny of the imported stock, will do much more to assist in building up this breed. Mr. Wallace secured both the boar and progeny prize and the trophy for breeders' group.

TAMWORTHS.

An increasing tendency for Tamworths to become too compact and to carry too much condition for their size and age makes the judging of this breed difficult.

The championship in the male classes was won by M. Moffatt with a grandson of that remarkable old boar, Whittingham Red Start (imp.), a boar whose progeny have realised over £1,000, in addition to producing a very large number of prize winning and useful breeding animals. The reserve champion was Lawn Hill Rex, shown by F. Thomas, a new exhibitor from the Beaudesert district. Wide Bay Stud obtained first award in the class for boar two years and over with South Burnett Starlight. Wollongbar Sunstar, shown by P. V. Campbell, was placed second. In the class for boars under seventeen months but over eleven months, the boar Wattledale Wonder, shown by Mr. Barkle, secured the award, and was afterwards purchased for a Government Stud in Western Australia. O. L. Klein's exhibit won the second award. Mr. Barkle obtained many of the awards in the younger boar classes, sharing these with Messrs. Campbell, Moffatt, and Champney.

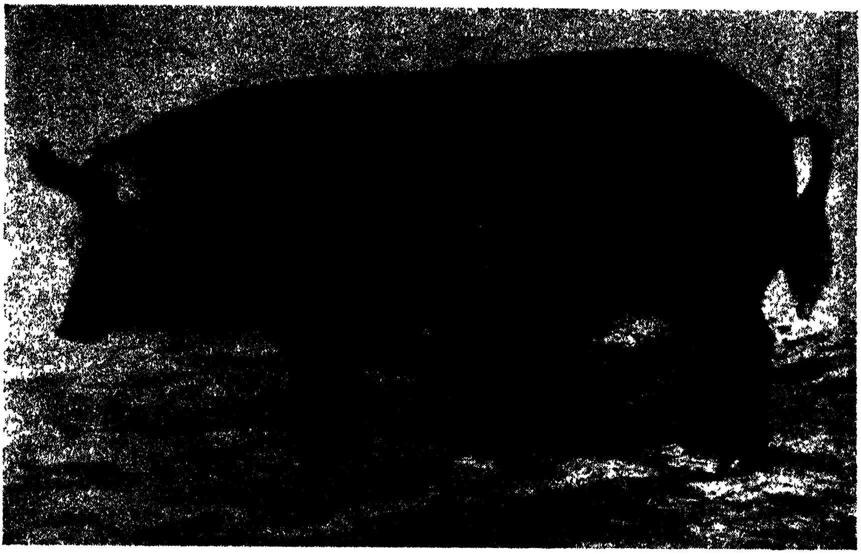

Plate 184.

Mr. J. Barkle's Champion Tamworth Sow, "Wattledale Lydia Pet," a deep-bodied, roomy matron of modern type.

The Tamworth sows and litters were the best seen at any Australian show, an indication that, if properly handled, this breed will continue to maintain its reputation for prolificacy. P. V. Campbell secured first and E. M. Melville second awards, with sows and litters, that were hard to beat.

The champion sow, Wattledale Lydia Pet, was a very fine animal, and should develop into a grand breeder as she lengthens out and becomes deeper in body. Mr. Barkle also secured reserve champion with the champion's dam, Ascot Vale Lydia Pride, a really good sow, which has reared excellent litters. E. L. Melville and the Wide Bay Stud shared awards in the class for sows eleven months old and under seventeen months, in which Mr. Campbell's exhibit also was placed.

Plate 185.

Mr. P. V. Campbell's prize winning Tamworth Sow and Litter. The sow, "Wattledale Lydia Pride," was giving her litter liberal supplies of milk, and is herself a really good mother.

The first prize sow in the under five months old class, shown by Mr. Barkle, also has since been sent to Western Australia. Mr. Campbell won in the boar and progeny class, and Mr. Barkle secured the breeders' group award.

WESSEX SADDLEBACKS.

The Wessex Saddleback breed is making steady progress, and this year's exhibits were the best that have been seen at any Australian show so far. The championship was won in the male classes by Pensilva Monarch 2nd, shown by Bruce P. Stephens, of the Richmond River, New South Wales. E. B. Ruthenberg's exhibit also was a winner in the aged boar class. The reserve champion boar was R. Turpin's Pensilva Jumbo 3rd.

The sows and litters were good, the awards being gained by R. Turpin, the original importer of this type, whose entries, with those of Messrs. Stephens, Ruthenberg, and Sellars, also were awarded prizes.

YIELD OF CARCASE IN PORK AND BACON PIGS.

The loss of weight in transit of a pig from farm to factory, and then during dressing, varies very much, and it is not possible to say exactly what weight a pig will lose.

Factors which affect the amount of loss are:—The size of the pig—the larger pig will lose a lower percentage—the manner in which the pig had been fed; the length of the journey from farm to factory; the conformation and condition of the pig and the amount of food contained in its alimentary tract when it is weighed alive.

In tests it has been shown that under conditions similar to those ordinarily ruling in Queensland, pigs weighing 150 lb. to 200 lb. alive on the farm lose about 10 per cent. of this weight in transit to the factory, and then another 20 per cent. in dressing. Lighter pigs, weighing 100 lb. to 140 lb. alive, usually lose approximately 33 per cent. by the time they are dressed. Whilst these figures possibly are a fair average, individual pigs vary considerably according to the factors already mentioned.

As a rough guide in estimating dressed weight from live weight, farmers usually take seven-tenths of the live weight for baconers and two-thirds of the live weight for porkers.

—*L. A. Downey.*

A Substitute for Milk in Pig-feeding.

L. A. DOWNEY, Instructor in Pig Raising.

ONCE again at this time of the year most pig raisers are faced with the problem of feeding pigs with little or no milk. It is known generally that meatmeal is a good substitute for separated milk in the pig's diet, but unless it is used carefully, meatmeal may prove an expensive food.

Meatmeal, which is a by-product of abattoirs and meatworks, is sold under several trade names and some varieties contain a small percentage of bonemeal. It is a wholesome food, convenient to use, and costs from 9s. to 10s. 6d. per 100-lb. bag, Brisbane, the higher-priced brands containing a higher percentage of protein.

As meatmeal is so expensive in comparison with pig foods grown on the farm, it should not be used more freely than is necessary.

Separated milk, which meatmeal replaces, is used according to its availability, pigs sometimes receiving milk as their sole diet, but actually pigs will thrive on very small quantities of milk used in combination with grain and other foods such as pumpkins and sweet potatoes; the milk supplies a large part of the protein necessary to balance the ration. Each pig from the time of its weaning until the baconer stage and each dry sow should receive a minimum of three-quarters of a gallon of separated milk daily, and each sow with a litter double that quantity.

When these minimum quantities of separated milk are not available, meatmeal may be substituted, using ½ lb. of meatmeal to replace each three-quarters of a gallon of separated milk.

Pigs thrive on a mixture of milk and meatmeal, or meatmeal alone as the protein-rich portion of the diet. The quantities used should not exceed from ¼ to ½ lb. daily per pig from weaning to baconer stage, according as to whether good lucerne is available or not; and ½ lb. for each dry sow and 1 lb. daily for each sow with litter.

By feeding a constant quantity of separated milk or meatmeal, and increasing the grain and other foods according to the pig's appetite, the nutritive ratio is widened automatically as the pig grows and satisfies its requirements.

In cases where pigs have access to good young pasture or green crops, the minimum quantity of separated milk or meatmeal stated above may be reduced by up to 50 per cent., depending on the quality of the green foods.

Meatmeal may be fed dry or mixed with milk or water.

◆

"A PIG PRODUCER'S PARADISE."

"Climatic advantages which enabled the growing of abundant and cheap food all the year round and the keeping of pigs in the open with a minimum of expense makes Queensland what would be regarded by many less favourably situated countries as a pig producer's paradise." That was what a Southern pig farmer said to his neighbours when he got back home from a Queensland tour which included the Darling Downs, Gympie, and Mary River districts, where the conditions are, to his mind, the very best for large-scale pig raising. Of the pigs slaughtered for export last year, more than half were contributed by Queensland.

Export Bacon Pigs at the Brisbane Show.

TO encourage the production for export of the most desirable class of pig meat the Royal National Association provides attractive classes in its schedule each year. This year the class for export baconers suitable for the English trade provided for the judging of the pigs alive and as carcases.

The prize money for the class amounted to £40, of which £25 was provided by the Department of Agriculture and Stock, by direction of the Honourable the Minister, Mr. F. W. Bulcock.

The results of the competitions are so interesting and instructive to pig raisers that they are presented here, together with the comments of the judges, Messrs. E. J. Shelton, Senior Instructor in Pig Raising, and L. A Downey, Instructor in Pig Raising. Mr. Downey judged the live pigs, and Mr. Shelton and Mr. Downey judged the carcases.

The schedule required entries of three baconer pigs, either pure-bred or sired by a pure-bred boar, each 180 lb. to 220 lb. live weight, most suitable for the English market.

The pigs were judged, firstly, alive on the showground on the 16th August as a pen of pigs using a score card, which, it was expected, would give exhibitors a little indication of their value, in the opinion of the judge. Notes made by the judge at the time of judging the live pigs are shown on the award sheets. The pigs were kept at the showground during show week, and then transported to the Brisbane Abattoir, where they were slaughtered on the 25th August. During the time the pigs were held at the showgrounds and at the Brisbane Abattoir they were fed; but there is a possibility of some of them gaining weight and of others merely maintaining their weight, or even losing. Probably the thin pigs became thinner and the fat pigs became fatter during the period.

After the pigs were slaughtered and dressed, and the carcases chilled, they were judged on the system of measurements as provided by English authorities for use on Empire pigs being supplied to the United Kingdom. This system of valuation has been standardised, after several years of research work, by three eminent scientists and one of Smithfield's leading authorities in the pork trade; it is based on measurements and standards which leave practically nothing to the individual opinion of the judge.* The system of valuation is closely related to consumer requirements, and so it can be taken as the most exacting and reliable guide to carcase quality. The marking standard of this English system is severe; and so it is a good carcase which gains 50 per cent. or more of the maximum marks. Measurements are taken in millimetres rather than inches to avoid fractions; 25 millimetres equals 1 inch.

When it is possible to judge carcases, there is little, if anything, to be gained by judging the pigs alive, for in the live pig the judge must use his imagination to some extent, and in the class under review it must be considered somewhat fortuitous that the pens awarded first and second alive gained the same awards in the carcase competition.

There were nine entries in the competition, and full details of the awards to individual pigs and to each entry are given in the attached sheets.

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* For further information of this system of carcase judging, see the Pig Breeders' Annual, 1936-37, or the "Queensland Agricultural Journal," August, 1937.

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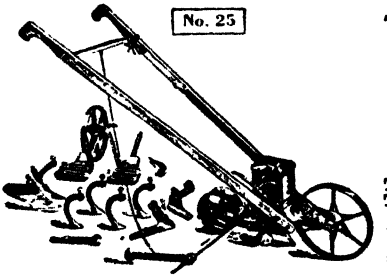

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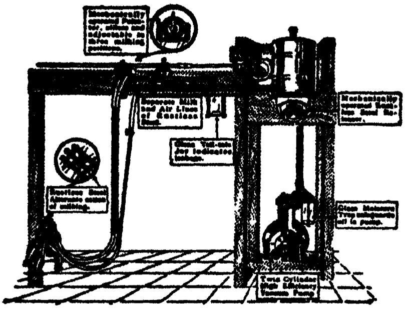

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The class as a whole appeared to be a fairly good lot, although there were a number of entries which were obviously too thick—that is, too fat and short in relation to their weight—and there was sufficient difference between the best and the worst to provide a good object lesson to interested people.

Criticism during show week by breeders of pigs and others was interesting in that the bulk of opinion was that some individual pigs were much too thin. The carcases, however, revealed that most of the pigs were too fat rather than too thin, and the only pig which was too thin was actually only 3 millimetres below the ideal for backfat measurement and gained 17 marks from a maximum of 20, which was the fifth highest award for the whole twenty-seven pigs. This particular pig gained the highest score in the carcase judging, with 94 marks from a possible 115. This seems to indicate that general opinion favours a live pig which is actually too fat for the English trade, for which Australia is catering.

The carcase values of individual pigs may be seen from a study of the award sheets and the accompanying photographs, each telling a useful story.

Comments on the Individual Entries.

Entry No. 432, Large Whites, entered by Mr. S. S. Appleby, Maroon, were good baconers, one pig being noted as a little slack when judged alive. Actually this pig, although slightly thin, gained the greatest total when judged as a carcase. These pigs were good in most respects, their weakest feature being the eye of meat, which could have been thicker. This entry won both the live pig and carcase competitions.

Entry No. 433, Tamworth x Berkshire pigs, were entered by Mr. H. C. Badke, Beaudesert. They were noted alive as being too short and thick, and the carcases revealed this to be the case, as the three pigs gained only 30 per cent. for backfat thickness, and 11·6 for body length in proportion to weight, even though they were very lightweight carcases. This indicates that they were more of the porker type pigs than of the heavy baconer type.

Entry No. 434, Tamworth, entered by Mr. P. V. Campbell, Lamington, were considered to be too short and fat in the middle, and too long in the legs when judged alive. Their carcases lost points on the hams, and gained only 31·6 per cent. for backfat and 13·3 per cent. for body length, in proportion to weight. One of these pigs, weighing 161 lb., gained the lowest award for leg length, its leg measuring 612 millimetres.

Entry No. 435 were Mr. M. Gnech's Berkshire x Tamworth. They were noted as being too short and thick at the live judging. Their carcases scored well in many respects, but lost heavily in backfat and body length. These pigs probably would have made good heavy porkers, or light baconers, but were over-conditioned at heavy bacon weights.

Entry No. 436 were Large Whites, shown by Mr. J. A. Heading, Murgon. At the live judging they were noted as good but somewhat thick, and were placed sixth, being 5 points behind the third prize pen. Their carcases scored very well in most respects, gaining well in streak and backfat, but receiving only 23 per cent. for body length. However, their consistency in all other points brought them up to third place in the carcase competition.

Entry No. 437, Mr. E. L. Melville's Tamworths, were noted as a good pen, but too leggy and somewhat slack underneath. Their carcases gained 92·8 per cent. for eye muscle, which is particularly good. However, two carcases in this entry failed badly in being too fat and too short. They also were too long in the leg.

Entry No. 438 were Mr. E. B. Ruthenberg's Wessex Saddlebacks. These pigs were noted as being a good pen with one pig somewhat slack underneath, and one being over-conditioned. The carcases scored fairly well in all points excepting backfat, where two of them lost heavily through being too fat, the other pig scoring 16 out of 20 marks on this feature. This entry gained third place in live judging; but through two of the carcases gaining only one point from a possible 20 for backfat, the entry went back to fifth place in the carcase judging.

It is interesting to note that the general opinion on this pen at the showground was that one of the pigs was unfinished. Its carcase, however, gained 80 points, as compared with 62½ and 59½ gained by the other two pigs which were too fat.

Entry No. 439 was a pen of Wessex, exhibited by Mr. R. Turpin, Lowood. This pen gained second prize alive and second prize as carcases. The noting on this pen, when judged alive, was that they were a good lot but somewhat leggy and slack underneath. The remark about their leg length was not borne out by the measurement on the carcases; but the slackness underneath, apparent in the live pigs, probably can be associated with the marks gained for the streaks, which were not all that could have been desired. These carcases were consistently good, and one of their best features was their good thickness of eye muscle. Each of these pigs showed "seedy cut" in the belly.

An interesting feature about one pig in this entry, whose carcase weight was 163 lb., was its good body length. It was the longest bodied pig in the competition, measuring 836 millimetres, and gaining 18 marks out of 20 for this feature. This pig had 15 pairs of ribs, more than any other pig in the competition, and it also had 16 well-placed teats. This might be taken as an indication that good body-length is associated with a large number of well-spaced teats.

Entry No. 440 were Berkshire x Large Black, exhibited by Mr. J Vellacott, Boonah. These pigs were noted, when judged alive, as being too thick for their weight, and they were placed last in the live awards. Their carcases gained fair marks in most respects and 89·5 per cent. for hams; but, in two of the most important features—namely, backfat and body length—they lost heavily, being much too fat and too short in comparison to their weights. These pigs' carcases all had a dark pigmentation on the skin.

Whilst it would not be wise to draw inferences regarding the comparative merits of various breeds for heavy bacon from the few pigs included in this report, individual breeders will be able to arrive at their own conclusions regarding the trend of "type" within their breeds.

TABLE I.

—	Maximum Marks.	Catalogue No. 432. Tattoo W1.				Catalogue No. 432. Tattoo W3.				Catalogue No. 434. Tattoo W4.			
		Weights on 25-8-37.			Total Per Cent of Three Pigs.	Weights on 25-8-37.			Total Per Cent. of Three Pigs.	Weights on 25-8-37.			Total Per Cent. of Three Pigs.
		150	165	145		131	132	140		183	141	161	
AWARDS FOR LIVE PIGS.													
Condition	70	67			95·7	52			74·2	58			82·8
Uniformity and type	20	18			90·0	12			60·0	15			75·0
General appearance	10	9			90·0	5			50·0	6			60·0
Total	100	94			94·0 First	69			69·0 Seventh	79			79·0 Fourth
Judge's comments on live pigs	..	Good, one pig a little slack underneath.				Too short and thick.				Somewhat short in middle and too fat: too long in legs.			
AWARDS FOR CARCASES.													
A. By inspection—													
Skin—Smooth and fine	5	5	5	5	100·0	4	4	4	80·0	4½	4½	4½	90·0
Fat—Firm	10	10	8	10	93·3	9	9	8	86·6	9	9	9	90·0
Hams—Well-filled and fine-boned .	8	4½	8	4½	70·8	5	6	5	66·6	4½	4½	4	54·1
Shoulders—Light	7	5½	5½	7	85·7	4½	4½	4	61·9	5½	7	6	88·1
Streak—Thick, full of lean meat	12	11	11	11	91·6	5	5	5	41·6	7	5	7	52·7
B. By measurement (in mms.)—													
Eye muscle of loin—Thick	28	[45] 19	[40] 13	[43] 17	58·3	[42] 17	[43] 18	[34] 3	45·2	[52] 24	[37] 9	[45] 18	60·7
Back-fat thickness—Correct proportion to weight	20	[18] 17	[28] 12	[24] 16	75·0	[29] 1	[23] 16	[38] 1	30·0	[33] 4	[31] 1	[27] 14	31·6
Body—Long, in proportion to weight	20	[811] 17	[807] 10	[800] 17	73·3	[695] 2	[705] 4	[712] 1	11·6	[786] 1	[733] 6	[742] 1	13·3
Leg length—Short, in proportion to weight .	5	[546] 5	[536] 5	[570] 4	93·3	[544] 5	[514] 5	[528] 5	100·0	[574] 5	[583] 2	[612] 1	53·3
Total	115	94	77½	87½		52½	71½	36		64½	48	64½	
Total (three carcases)	345	259			75·07 First	160			46·37 Eighth	177			51·01 Seventh
Grand Totals (live pigs and carcases) ..	445	353			79·3 First	229			51·01 Eighth	256			57·5 Sixth

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the [black] figures.

TABLE II.

	Maximum Marks.	Catalogue No. 435. Tattoo W5. Carcase Weights on 25-8-37. 155	149	152	Total Per Cent. of Three Pigs.	Catalogue No. 436. Tattoo W6. Carcase Weights on 25-8-37. 152	150	142	Total Per Cent. of Three Pigs.	Catalogue No. 437. Tattoo W7. Carcase Weights on 25-8-37. 150	161	151	Total Per Cent. of Three Pigs.
AWARDS FOR LIVE PIGS.													
Condition	70		50		71·4		55		78·5		57		81·4
Uniformity and type	20		12		60·0		14		70·0		14		70·0
General appearance	10		5		50·0		6		60·0		6		60·0
Total	100		67		67·0 Eighth		75		75·0 Sixth		77		77·0 Fifth
Judge's comments on live pigs		Too short and thick.				Good, somewhat thick.				Good ; leggy, and a little slack underneath.			
AWARDS FOR CARCASES.													
A. By Inspection—													
Skin—Smooth and fine	5	4	4	4	80·0	4½	4½	4½	90·0	3½	3½	3½	70·0
Fat—Firm	10	10	10	10	100·0	7	7	7	70·0	7	7½	7	71·7
Hams—Well-filled and fine-boned	8	8	7	7½	93·7	5½	5	5½	66·6	4	4	4	50·0
Shoulders—Light	7	3½	3	3	45·2	4½	4½	4½	64·3	6	6	6	85·7
Streak—Thick, full of lean meat	12	7	7	7	58·3	10	10	10	83·3	9	9	9	75·0
B. By Measurement (in mms.)—													
Eye muscle of loin—Thick	28	[48] 22	[44] 18	[45] 19	70·2	[49] 23	[45] 19	[47] 21	63·1	[51] 25	[52] 25	[54] 28	92·8
Back-fat thickness—Correct proportion to weight	20	[30] 4	[35] 1	[29] 7	20·0	[23] 18	[24] 18	[18] 18	90·0	[33] 1	[32] 1	[36] 14	26·6
Body—Long, in proportion to weight	20	[728] 1	[706] 1	[728] 1	5·0	[751] 5	[733] 2	[742] 7	23·3	[743] 4	[764] 4	[790] 11	31·6
Leg length—Short, in proportion to weight ..	5	[503] 5	[512] 5	[522] 5	100·0	[546] 5	[564] 5	[558] 5	100·0	[587] 3	[590] 3	[580] 3	60·0
Total	115	64½	56	63½		82½	75	82½		62½	63	85½	
Total (three carcases)	345		184		53·33 Sixth		240		69·56 Third		211		61·15 Fourth
Grand Total (live pigs and carcases) ..	445		251		56·4 Seventh		315		70·7 Third		288		64·7 Fourth

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the [black] figures.

TABLE III.

—	Maximum Marks.	Catalogue No. 438. Tattoo W8.				Catalogue No. 439. Tattoo X7.				Catalogue No. 440. Tattoo X8.			
		Carcase Weights on 25-8-37.			Total Per Cent. of Three Pigs.	Carcase Weights on 25-8-37.			Total Per Cent. of Three Pigs.	Carcase Weights on 25-8-37.			Total Per Cent. of Three Pigs.
		151	152	146		157	170	163		157	168	161	
Awards for Live Pigs.													
Condition	70		58		82·8		67		95·7		50		71·4
Uniformity and type	20		15		75·0		16		80·0		12		60·0
General appearance	10		7		70·0		8		80·0		5		50 0
Total	100		80		80·0 Third		91		91·0 Second		67		67·0 Eighth
Judge's comments on live pigs		Good; one a little slack underneath, and one over-conditioned. Bone coarse.				Good; somewhat leggy and slack underneath.				Too thick for their weights.			
Awards for Carcases.													
A. By Inspection—													
Skin—Smooth and fine	5	3	3	3	60 0	3½	3½	3½	70·0	3½	3½	3½	70·0
Fat—Firm	10	9	9	9	90·0	7	7	7	70·0	7	5	6	60 0
Hams—Well-filled and fine-boned .	8	3	4	4½	47·9	6	5½	6½	75·0	7½	7	7	89·5
Shoulders—Light	7	4½	4½	4½	64·3	5	4	6	71·4	3	3	3	42·8
Streak—Thick, full of lean meat	12	6	6	6	50·0	8	8	8	66·6	7	7	7	58·0
B. By Measurement (in mms.)—													
Eye muscle of loin—Thick	28	[43] 17	[42] 16	[45] 19	61 9	[53] 27	[50] 23	[46] 19	82 1	[42] 16	[42] 15	[47] 20	60·7
Back-fat thickness—Correct proportion to weight	20	[33] 1	[32] 1	[24] 16	30 0	[26] 14	[31] 7	[22] 20	68 3	[37] 1	[36] 1	[32] 1	5 0
Body—Long, in proportion to weight	20	[793] 14	[780] 11	[782] 13	63·3	[798] 13	[802] 7	[836] 18	63·3	[724] 1	[709] 1	[762] 1	8·3
Leg length—Short, in proportion to weight ..	5	[548] 5	[552] 5	[560] 5	100 0	[546] 5	[587] 5	[563] 5	100 0	[528] 5	[537] 5	[551] 5	100·0
Total	115	62½	59½	80		88½	70	93		51	47½	52½	
Total (three carcases)	345		202		58·55 Fifth		251½		72·89 Second		154		44·64 Ninth
Grand Total (live pigs and carcases) ..	445		282		63·3 Fifth		342½		76·9 Second		221		49·6 Ninth

Note.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the [black] figures

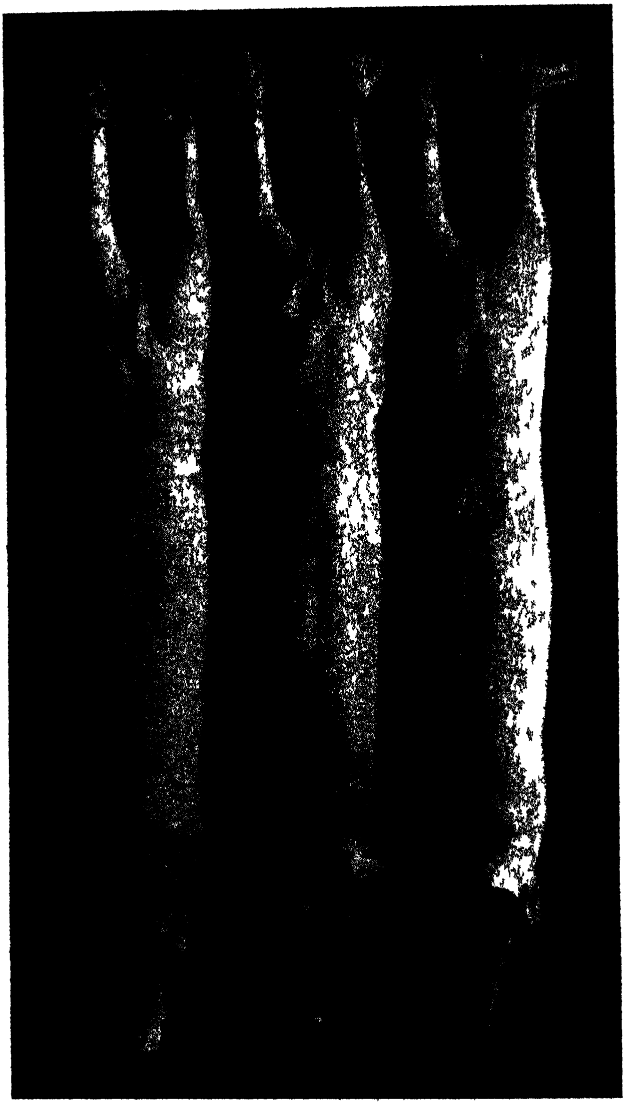

Plate 186

Catalogue No 432—Mr S S Appleby's carcases of Large Whites, which gained first prize Carcase weights, from left to right, 145, 165, 150 lb Note the great length in proportion to weight, giving a long, narrow appearance This entry gained the highest points for body length

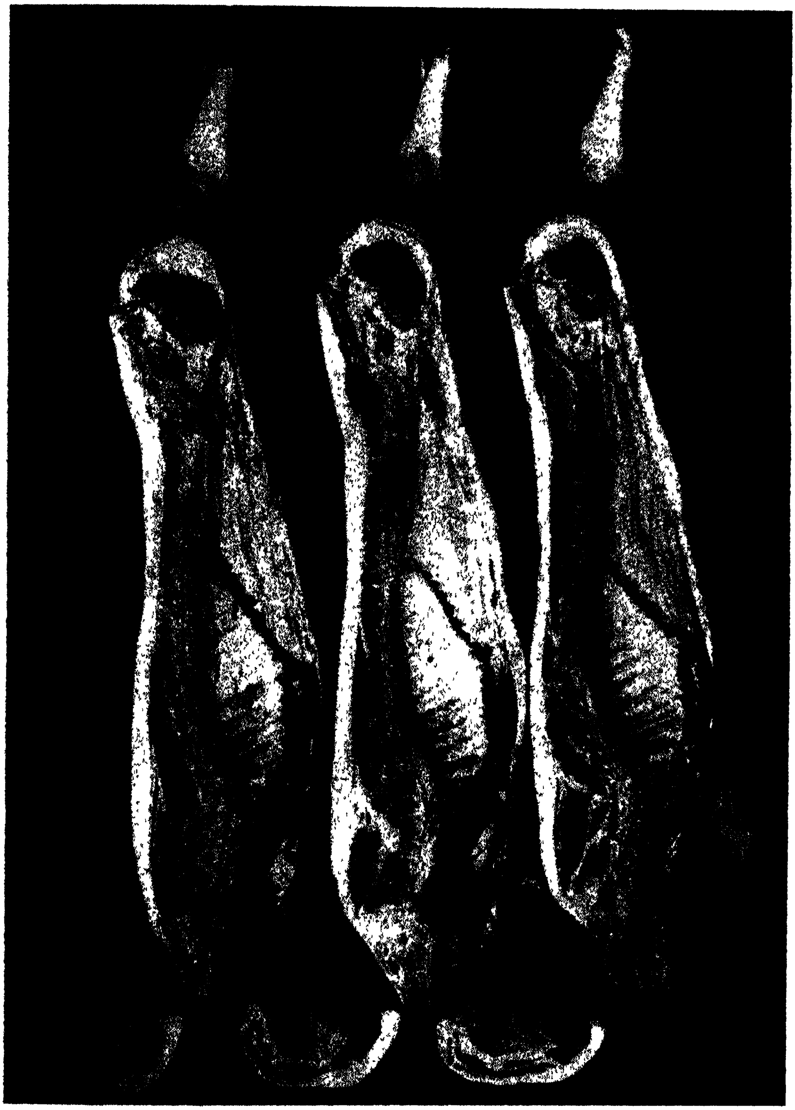

Plate 187.

The cut carcases of entry No. 432, as shown on the opposite page. Carcase weights, from left to right, 145, 165, 150 lb. Note the light covering of back fat and the thick, lean streak. This entry gained second highest award for back fat and the highest award for streak.

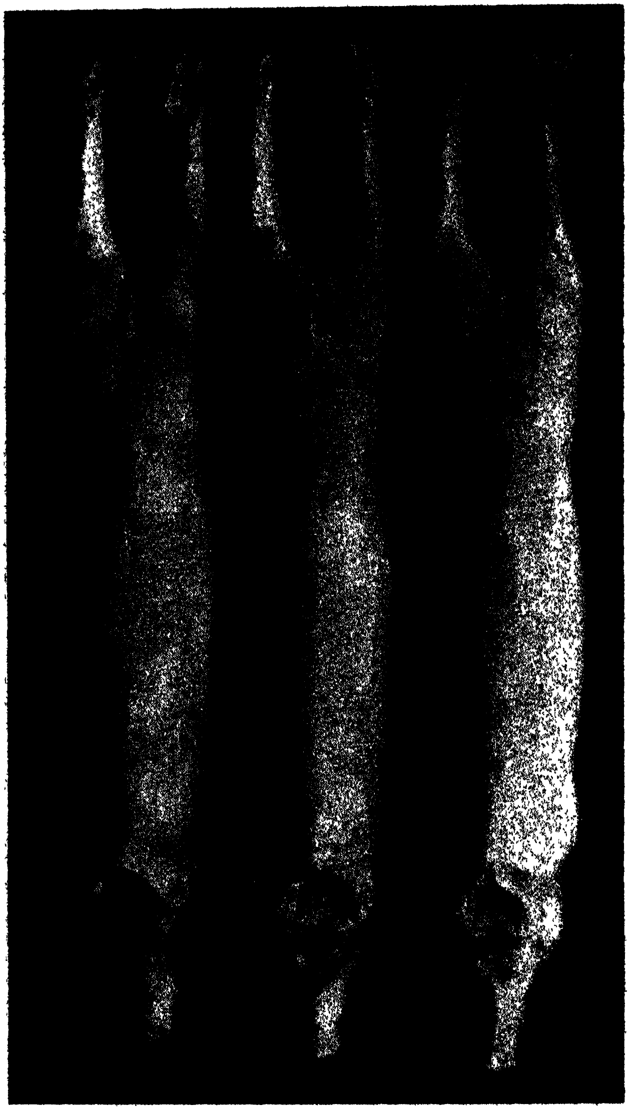

Plate 188.

Catalogue No. 433—Mr. H. E. Badke's Tamworth x Berkshire carcases, weighing, from left to right, 140, 132, 131 lb. These carcases were too short in relation to their weight. They were placed eighth in the carcase judging.

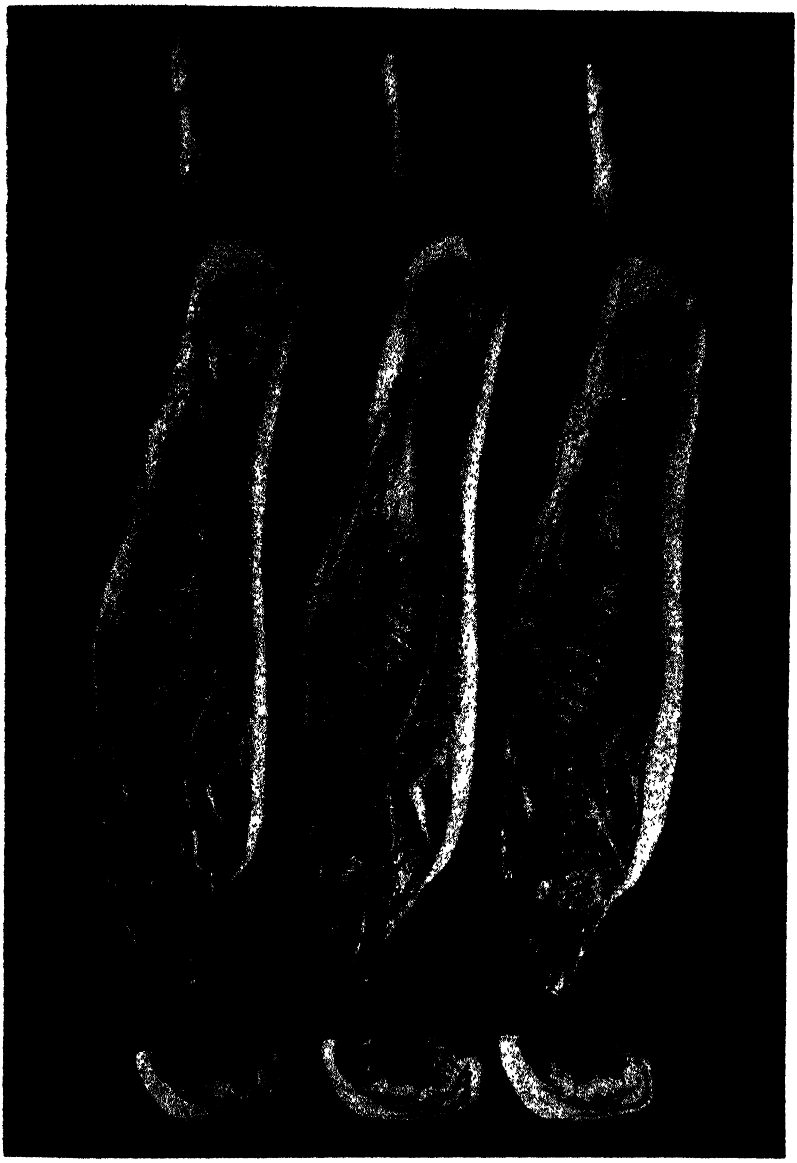

Plate 189.

The cut carcases of entry 433, shown on the opposite page; the weights, from left to right, are 131, 132, 140 lb. It will be noted that these carcases are comparatively fat.

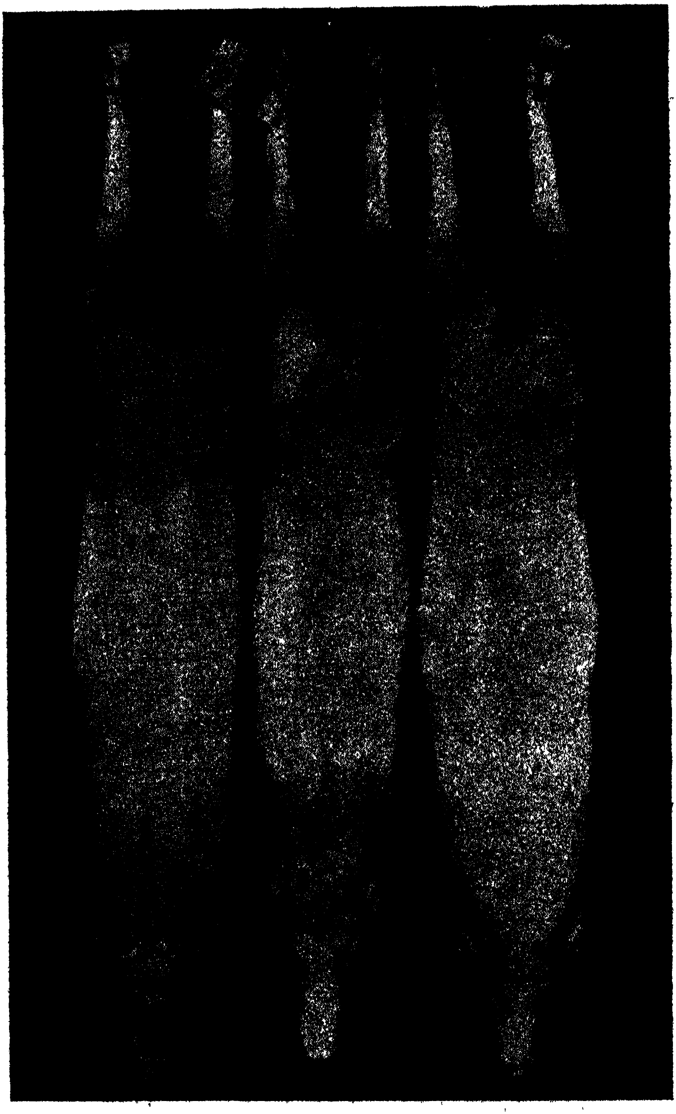

Plate 190.

Catalogue No. 434--Mr. P. V. Campbell's carcases of Tamworths, whose dressed weights are, from left to right, 161, 141, 183 lb. These carcases had particularly light shoulders, but were much too short in the body, and carried too much fat. They were placed seventh in the carcase awards.

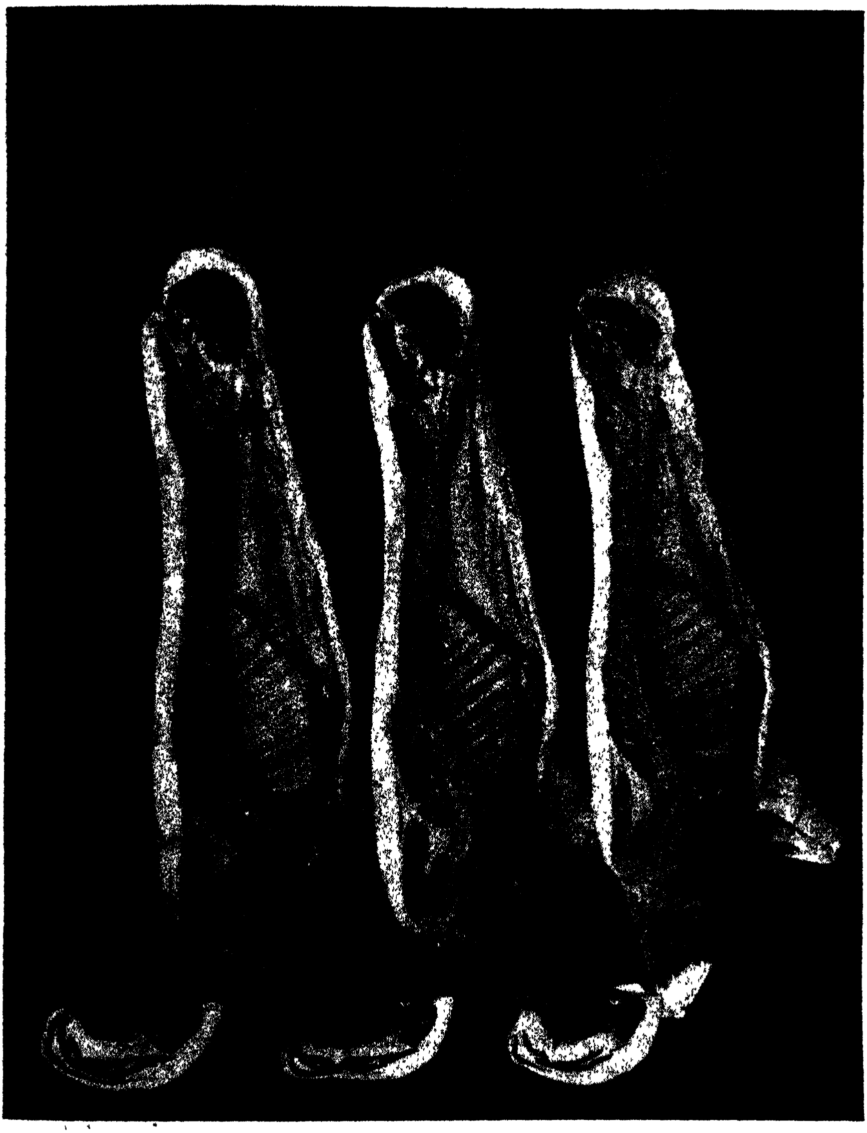

Plate 191.

The cut carcases of entry No. 434, shown on the opposite page; weights, from left to right, are 183, 161, 141 lb.

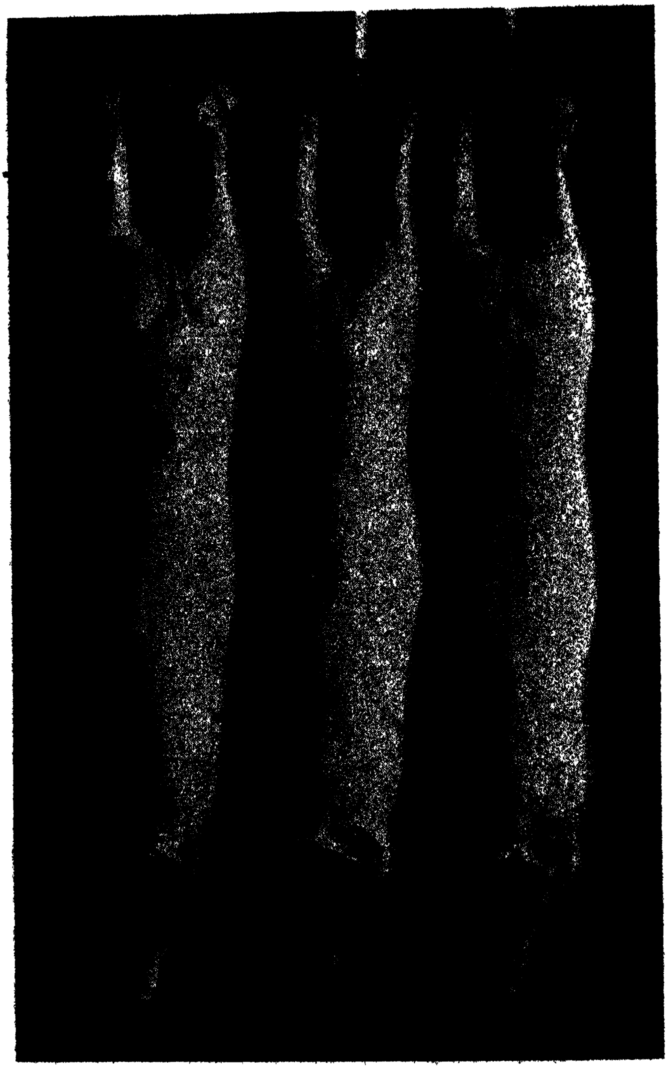

Plate 192.

Catalogue No. 435—Mr. M. Gnech's Berkshire x Tamworth carcases, weighing, from left to right, 155, 149, 152 lb. These carcases scored well for hams, but lost because the bodies were not long enough in proportion to their weights. They were placed sixth in the carcase competition.

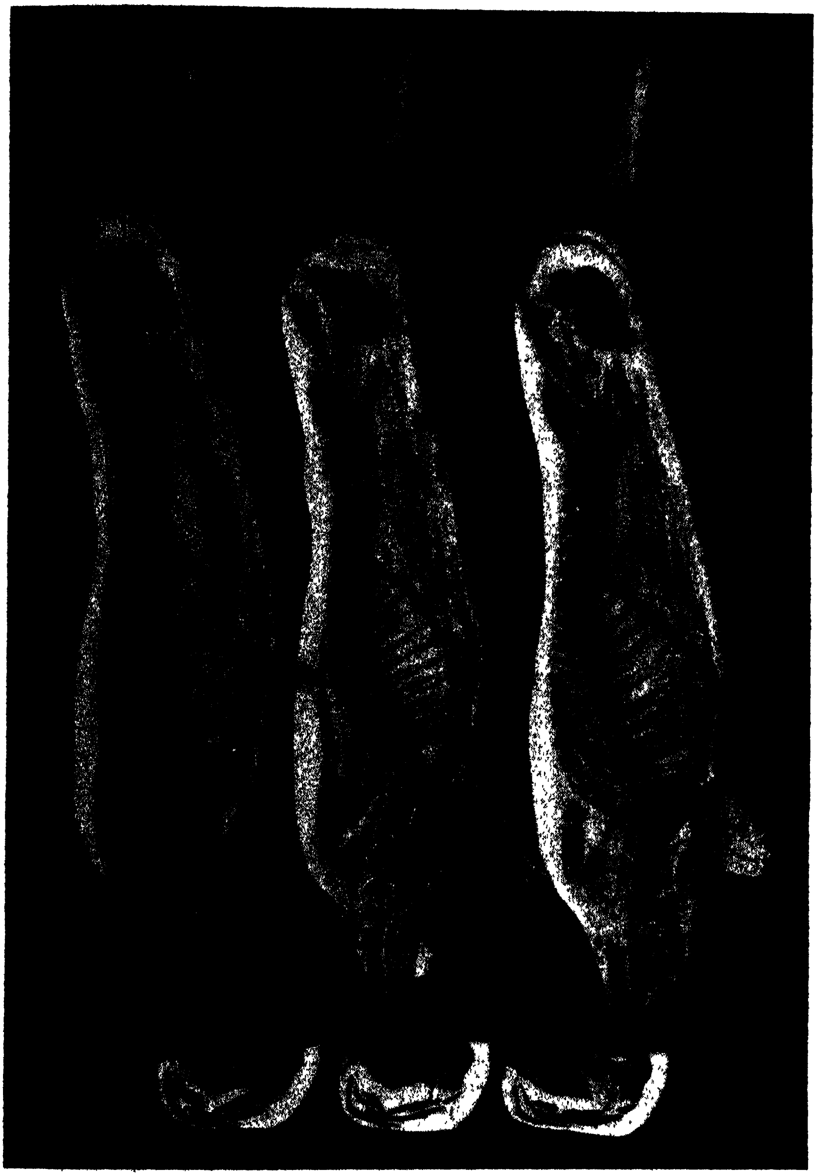

Plate 193.

Cut carcases of entry 435, shown on the opposite page. Carcase weights are, left to right, 155, 149, 152 lb. Note the excessive amount of fat, which was responsible for the weight being out of proportion to the body length.

Plate 194.

Catalogue No. 436—Mr. J. A. Heading's carcases of Large Whites, which won third prize. Their weights are, left to right, 152, 150, 142 lb. These carcases scored fairly well throughout, gained the highest points for amount of back fat, but were too short for their weight.

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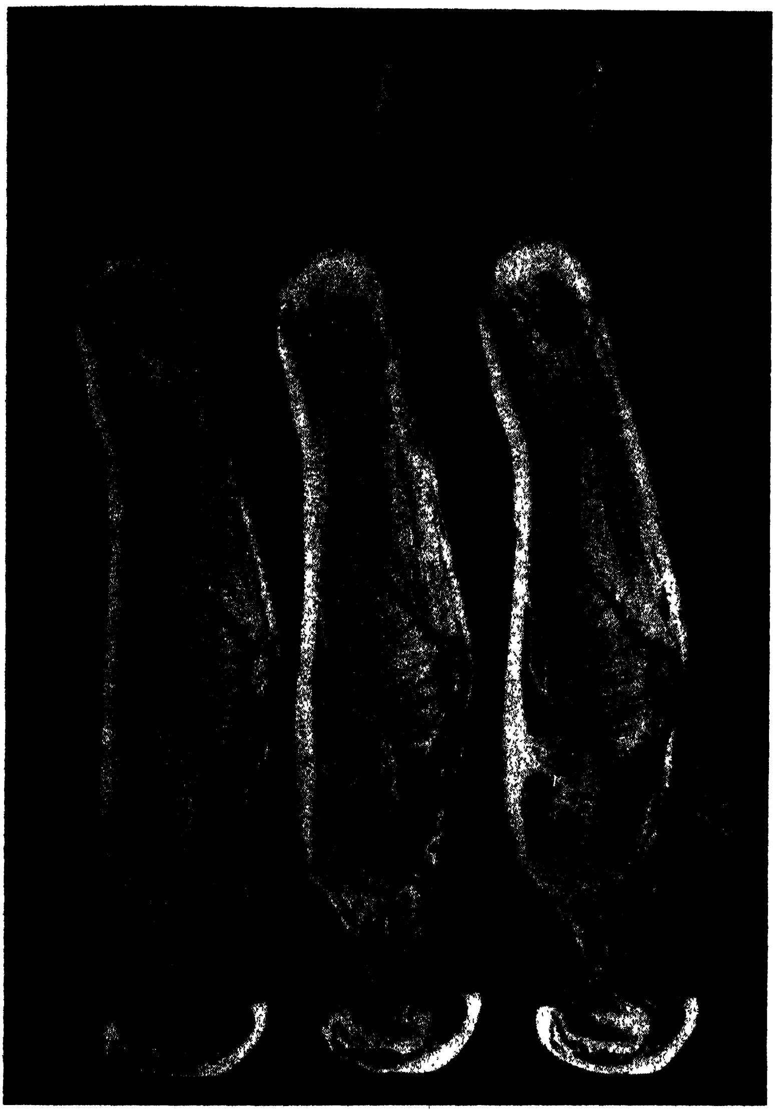

Plate 195.

The cut carcases of entry 436, shown on page 466, the weights being, from left to right, 142, 150, 152 lb. Notice the light covering of back fat and the good streaks.

Plate 196.

Catalogue No. 437—Mr. E. L. Melville's Tamworth carcases, weighing, from left to right, 151, 161, 150 lb. These pigs scored fairly well in most features, but carried too much back fat. This entry gained fourth place in the carcase judging.

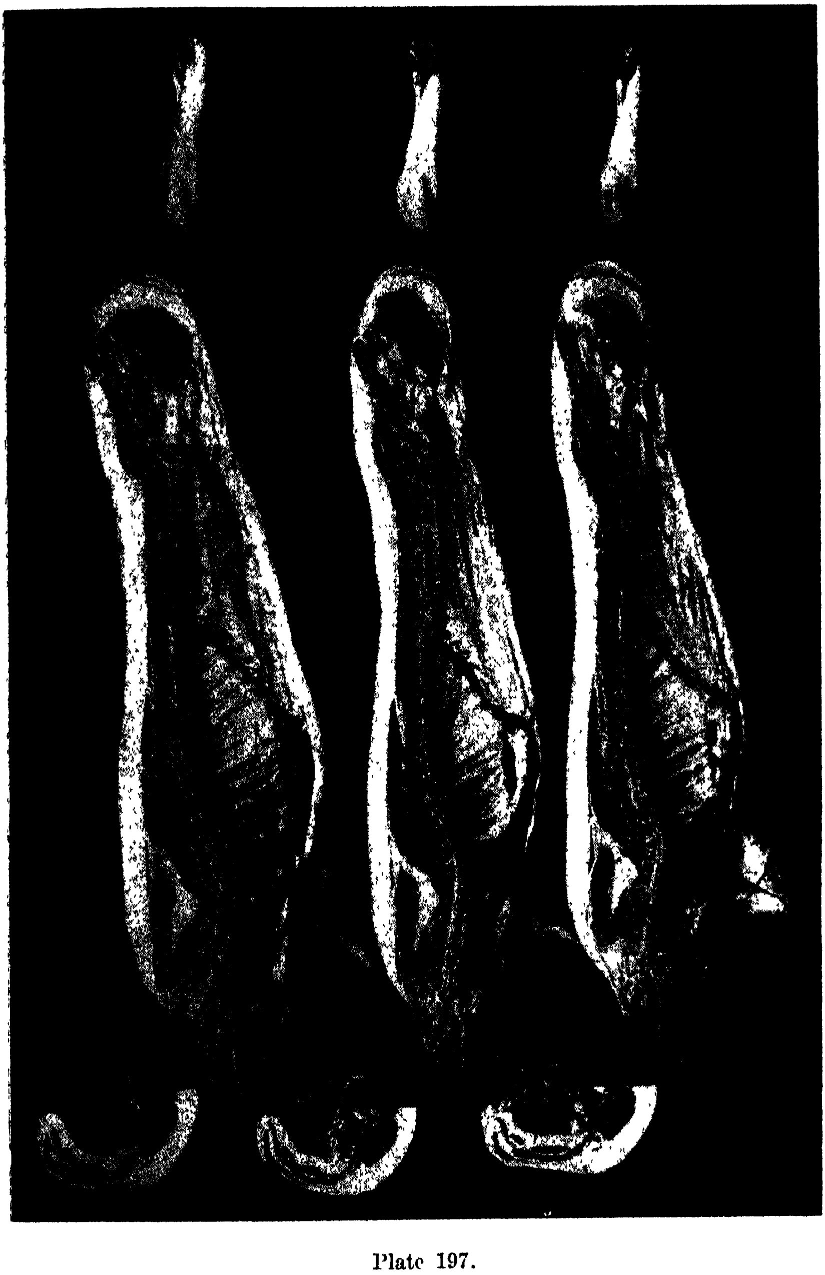

Plate 197.

The cut carcases of entry No. 437, shown on the opposite page. Weights are, from left to right, 161, 151, 150 lb. Note the thickness of the eye muscle. This entry scored 92.8 per cent., the highest award, for this particular feature, but lost points for carrying too much back fat.

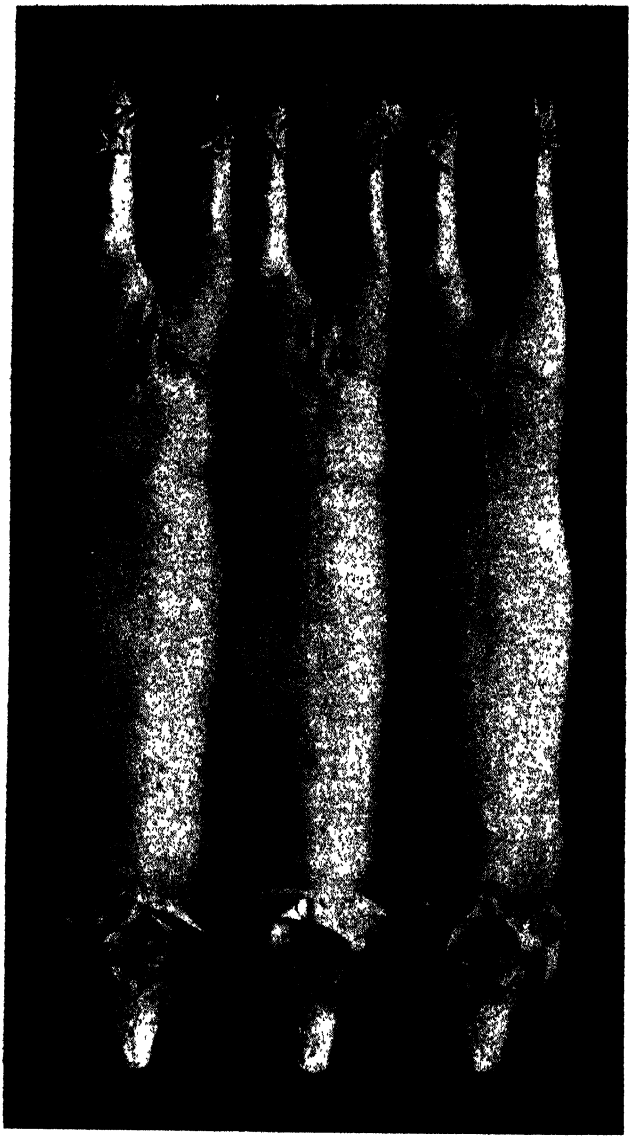

Plate 198.

Catalogue No. 438—E. B. Ruthenberg's Wessex carcases, weighing, from left to right, 146, 152, 151 lb. These were good carcases, but lost points through two of them being over-fat. This entry gained fifth place as carcases.

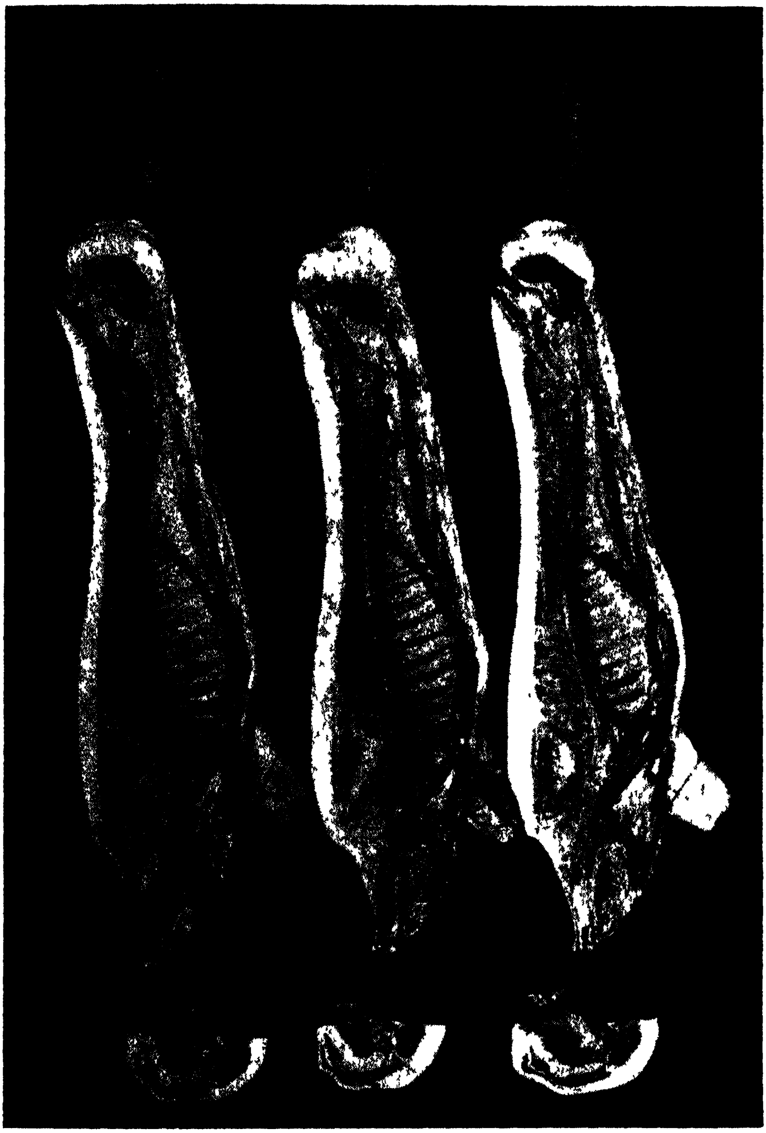

Plate 199.

The cut carcases of entry 438, shown on opposite page; the weights, from left to right, being 146, 151, 152 lb.

Plate 200.

Catalogue No. 439—Mr. R. Turpin's Wessex, whose carcase weights were, from left to right, 163, 170, 157 lb. This entry gained second prize, and were consistently good.

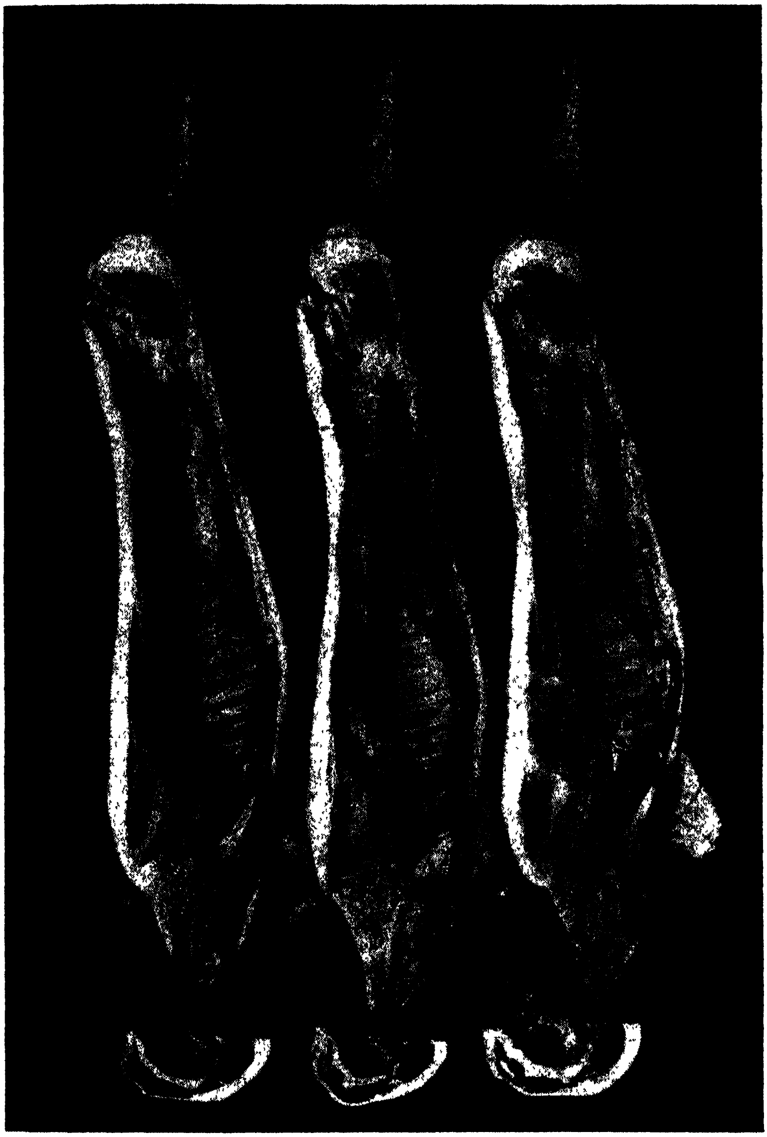

Plate 201.

The cut carcases of entry 439, shown on the opposite page, their weights, from left to right, being 157, 163, 170 lb. The carcase weighing 163 lb. scored the possible points for back-fat thickness, and 18 points out of 20 for body length.

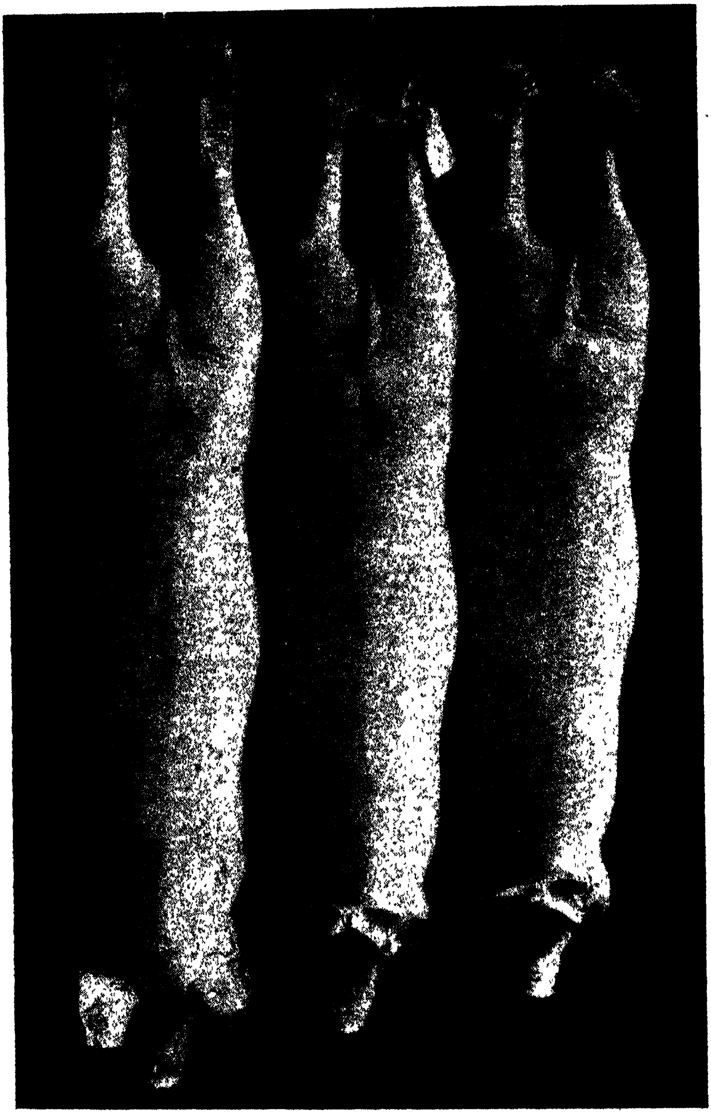

Plate 202.

Catalogue No. 440—Mr. J. Vellacott's Berkshire x Large Black carcases. Their weights were, from left to right, 161, 168, 157 lb. These carcases were good in the hams, but excessively heavy in the shoulders, and the bodies were much too short for their weights. They were placed last in the competition.

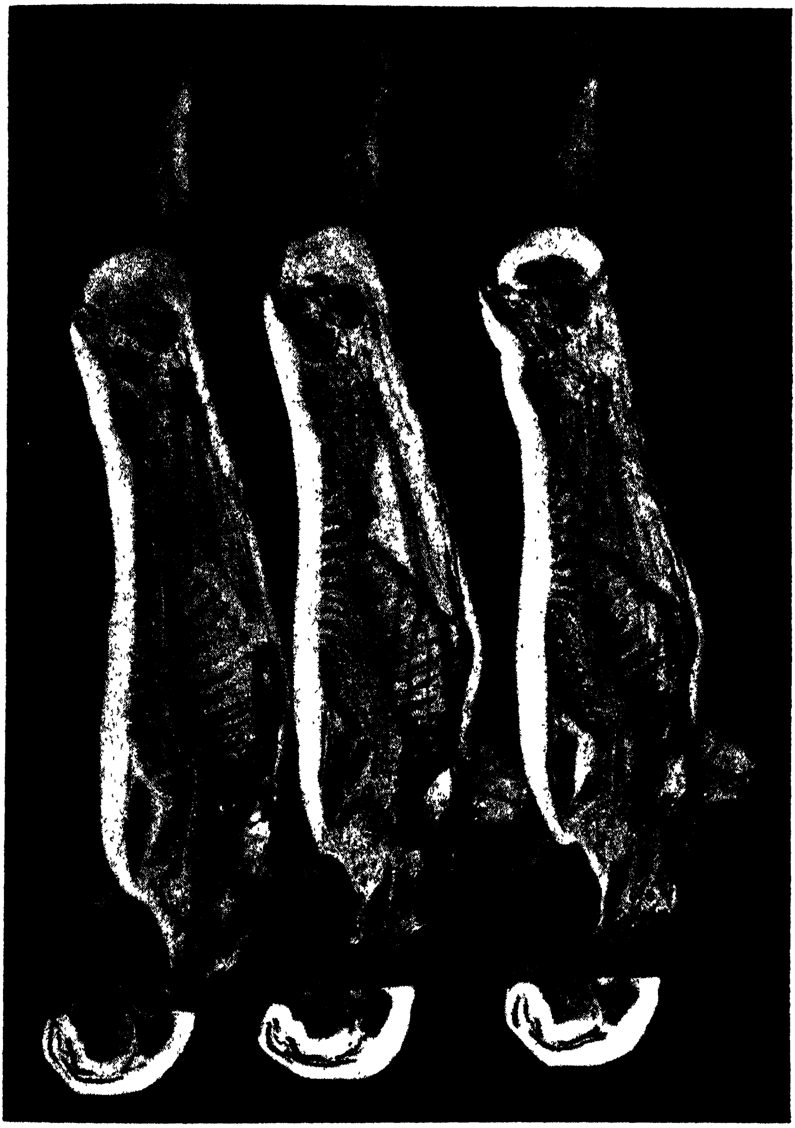

Plate 203.

The cut carcases of entry 440, weighing, from left to right, 161, 157, 168 lb. Note the very large proportion of fat to lean, which caused these carcases to score low points.

Housing Cockerels.

P. RUMBALL, Poultry Expert.

IN the rearing of any large number of cockerels, either for stud or table purposes, one of the outstanding problems is that of providing satisfactory housing. It happens frequently that cockerels are injured by fighting amongst themselves. Generally speaking, fighting is more prevalent among light breeds, such as white leghorns, than among Australorps and other heavy breeds.

The rearing of a large number of cockerels of a similar age could be arranged to great advantage by the provision of a special house. The type of house recommended is one in which the roof reaches approximately 2 feet from the ground. For efficiency, economy, and simplicity of construction, a building of the gable-end type should meet requirements. The size, naturally, will depend on the number of birds to be accommodated. A building 12 feet long by 8 feet wide will accommodate, as a maximum, 100 white leghorns or 80 Australorps. Approximately 1 square foot of floor space is allowed for each bird. Hens, however, should be provided with double that area under the same system, and the small space proposed for the cockerels is only practicable because of the fact that they will occupy the house only for a short period.

In the construction of such a building, the four corner posts may be 3 feet, and the two centre posts 7 feet high. By using 8 feet iron the roof will extend to within 2 feet of the ground. The gable-end should face to a point between north and east. This will permit of the front being left uncovered, while the rear or westerly end should be covered with iron to within 2 feet of the ground. Perches are the only fittings necessary. These should be all on the same level, and 3 feet above the floor. They should run lengthwise, and should be spaced 2 feet apart. Such spacing would obviate fighting on the perches.

It is essential for a building of this type to be erected in the centre of a large netted run, or at a distance from other buildings if the birds are to be reared on free range. In addition, it is advisable to erect a number of perches in different parts of the run. Such perches should be 3 feet high and situated away from boundary fences.

The advantages of this system of handling cockerels are that there are no corners or walls in the building, and on being chased the bird can escape easily by getting on a perch. An old cock bird placed in the pen, before the cockerels are three months of age, will assist materially in preventing the young birds from fighting.

◆

JUNIOR FARMERS' CLUBS.

Farmers in the making—the members of School Project Clubs - have many practical results to show for their youthful enthusiasm. In another State recently a young member topped the lamb sales with his stock. Another established an Australian record with 183 bushels of maize per acre, and yet a third gained the potato yield record. The movement is of great importance to a primary producing country like Queensland, since on the industry and efficiency of the next generation of farmers will rest the future of our land industries. The boys—and girls, too—are taught to call science to their aid, and to take advantage of modern knowledge and methods. At the cattle judging competition at a recent show, a judge of long experience remarked:—"If at their age I had known as much as these boys do, I would have been numbered among the great breeders long ago."

Care of Growing Pullets.

J. J. McLACHLAN, Poultry Inspector.

PULLETS are the principal source of profit during the period from March to June. Laying pullets are very easily upset—in fact, any slight alteration in feeding or management will be likely to bring about a cessation of egg production. For that reason, any proposed alteration in feeding or management should be made before the birds commence to lay.

Pullets should be so fed that their growth is continuous If dry mash is fed there must be ample feeding space—1 foot of feeding space for each ten birds is recommended. The hoppers should be constructed so that the feed does not jamb and leave the trough empty; hoppers wider at the bottom than the top achieve this objective. There must be ample mash always before the birds. Any shortage will retard growth, or, if they are laying, cause a cessation of production. Should the wet mash feeding system be adopted, it is most advisable to give one full meal of mash early in the morning, followed by a smaller meal at midday. These meals should be fed approximately at the same hour each day. In feeding adult birds, the general practice is to supply only the morning meal of mash; and, if it is desired to adopt this practice for the pullets when they are mature, it is essential that the mid-day meal of mash be discontinued before they commence laying. Chaffed green-feed or soaked lucerne chaff could be fed at midday to replace the meal of mash.

Growing mash should be fed until the pullets are about four months old, and then a change made to laying mash. Making a change at this age has the advantage of not affecting the birds. Should the change be left until the pullets have commenced laying, it is essential that the process be gradual, and at least one week taken to complete the change.

As a general rule the evening meal consists of grain—wheat or maize, or a mixture of these cereals. If it is desired to make a change in the grain ration this should be done prior to the start of production; or, if later, the change should be a gradual process.

Irregular supplies of water will retard growth or affect production to a greater degree than any other factor. Therefore, a strict watch should be kept to see that the pullets have a constant supply of clean, fresh water, and that it is situated in a cool, shaded place.

Pullets that are being reared in colony houses or temporary quarters must be moved to the permanent houses before they commence laying. Should this work be delayed until after they have commenced laying, there would be a general cessation of production. The number in each unit is an important factor. Pullets will make more uniform growth and production will be highest when kept in relatively small groups. Groups above 100 are undesirable.

Under no circumstances should pullets be overcrowded. One of the most common faults in poultry management is that a large number of pullets are reared without making the necessary provision for their accommodation.

THE CHICKEN SEASON.

A large proportion of the chickens that will be hatched during the coming few months will be culled during the various stages of growth, as being unsuitable for production in the future. Some of the culling may be necessary on account of the parentage of the individual, but by far the greater number of culls will be due to the lack of care, attention, and feeding.

Owing to the high cost of poultry food, the improper feeding of the chickens, particularly during the early days of life, is likely to be responsible for a greater percentage of culls than any other cause. Foods that are most suitable for chickens during this period are relatively costly, and efforts may be made by many to economise by substituting foods which, while they might prove satisfactory for older stock, are not entirely suited for the growth of young chickens.

Economic production is only possible from the well-grown, well-fed and well-bred birds; consequently, it is essential to give the layer of the future a good start in life. When it is considered that growing chickens, during the first six or eight weeks, do not consume very large quantities of food, the saving that may be made by the cheapening of the ration does not reduce the first costs to any material extent.

The following table indicate the reasonable weekly food consumption for chickens of two of the most popular breeds, and the average weight that chickens might be expected to be at these periods:—

TABLE SHOWING WEEKLY FOOD CONSUMPTION AND WEIGHT OF CHICKENS.

Week.	Leghorns.		Australorps.	
	Food Consumed, in oz.	Weight of Chick.	Food Consumed, in oz	Weight of Chick.
First	1·64	1·97	1·53	2·14
Second	3·36	3·31	3·32	3·61
Third	4·80	5.31	5·05	5·84
Fourth	6·46	7·61	7·20	8 68
Fifth	7·58	9·94	6·89	12·08
Sixth	8·96	12·92	10·62	15·86
Seventh	8·65	16·65	13·95	20·17
Eighth	13·29	20·41	15·05	25·31
Total	54·74	..	63 61	

Pounds food consumed per 100 chicks in eight weeks—Leghorns, 342, Australorps, 398.

The above table indicates that it takes about 350 lb. of food per 100 to rear White Leghorn chicks to the age of eight weeks and approximately 400 lb. of food to rear Australorps to the same age. The saving of 2s. or 3s. per 100 lb. consequently makes very little difference to the cost, but it may materially and adversely affect the growth that is desired. In nutritional experiments that have been conducted at the Animal Health Station, the following rations have given most satisfactory results:—

Ration.	1-8 Weeks.	8 Weeks to Maturity.
	lb.	lb.
Maize Meal	40	60
Bran	20	13½
Pollard	20	13½
Meat and Bone Meal	7½	5
Dried Buttermilk	10½	3½
Salt	1	1
Cod Liver Oil	1	1
Lucerne Meal	..	2½
Crude Protein Content	17·15%	14·40%

To those who mix their own rations, a mash containing the abovementioned ingredients is recommended. Those who prefer to buy a prepared mash should purchase none but mashes which have been made expressly for the purpose of feeding chickens and growing stock.

—*P. Rumball.*

THE TROPICAL FOWL MITE.

Most poultry farmers are familiar with red mite. Not many, however, are aware that there are two kinds of red mite, namely, the tropical fowl mite and the true red mite.

The tropical fowl mite is the more common of the two species. It usually lives and breeds upon the birds, though when very numerous the nest boxes and perches may also harbour them. The species is most frequent below the vent, on the tail, and sometimes on the neck. The female mite lays its eggs among the feathers. Here the young mites hatch, and may grow to maturity without leaving the bird.

The true red mite is slightly larger than the tropical fowl mite. Like the poultry tick, it is usually found on the birds only at night, hiding in the cracks and crevices in the perches, among litter, and in other sheltered places by day. In those places the female mite lays its eggs, the young mites visiting the birds only in order to feed.

Both the tropical fowl mite and the true red mite are blood suckers. When numerous they cause distinct injury, especially to young birds. Sitting hens may be so irritated as to leave the nest. In birds which are subjected to continuous attack, the feathers become dirty and bedraggled, and the skin takes on a scabby appearance. The true red mite is also a vector or carrier of the organism of fowl tick fever, a serious and frequently fatal disease.

These mites may be controlled easily if the following recommendations are carried out:--

(1) Remove and burn all litter, nesting straw, and similar material. See that the fowl-house is thoroughly clean.

(2) Spray the whole premises with crude oil or kerosene, forcing the spray well into all cracks and crevices.

(3) Paint the perches with nicotine sulphate half an hour before the birds go to roost. Repeat for two or three nights. This treatment is excellent, also, against lice.

(4) Watch carefully for any mites which have survived, and, if necessary, repeat the spraying with crude oil or kerosene and the painting of the perches with nicotine sulphate.

—*Dr. F. H. S. Roberts.*

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FEEDING OF GROWING CHICKENS.

After chickens are eight weeks old, it is still possible to use the all-mash system, but the crude protein content should be reduced to approximately 15 per cent. The easiest way to do this is by lowering the quantity of protein meal and dried buttermilk. From that stage onwards, some more fibrous material may be included in the ration with advantage and possibly lucerne meal would be the most convenient and desirable form for this to take.

A ration which has been found satisfactory in the all mash method of feeding growing stock consists of 60 per cent. of maize meal, 13½ per cent. each of bran and pollard, 5 per cent. of meat meal, 3½ per cent. of buttermilk powder, 1 per cent. of salt, and 1 per cent. of cod liver oil, and 2½ per cent. of lucerne meal. The approximate protein content of that ration is 15 per cent.

If it were desired to feed grain in conjunction with that mash on the basis of two-thirds mash and one third grain, and maize was available for the purpose, it would have to be remembered that maize had a protein content of roughly 10 per cent., and that the ration therefore would contain less than the 15 per cent. of protein required. It, therefore, would be necessary to increase the protein rich foods by adding either meat and bone meal, or dried buttermilk, and to reduce the maize meal used in the mash. If, on the other hand, there was plenty of skim milk available, the chickens could be given that to drink, and they would obtain from it sufficient protein for their requirements under those conditions. While it is possible for a fairly definite rule to be laid down as to the protein requirements of the chickens, some latitude in respect of the kinds of food used is allowable. Full information on this important subject is obtainable from the Department of Agriculture and Stock, Brisbane.

The Papaw.

H. BARNES, Director of Fruit Culture.

Part I.

THE native home of the papaw is recorded as being tropical America, although the actual part to which it is indigenous is not known definitely. The plant is easily propagated from seed, and this fact has aided its rapid dissemination throughout the tropical and, to some extent, subtropical, countries of the world. There appears to be no record of how and when it was introduced into Queensland, but it is now grown in all our coastal districts in frost-free situations. It probably is one of the most susceptible of tropical plants to frost injury, and should be planted always above this level.

THE PLANT, ITS HABIT, AND ITS FRUIT.

The papaw is a giant herbaceous plant rather than a tree, attaining a height of 12 to 20 feet. According to its natural habit it develops only one stem, with no lateral branches, and surmounted by a tuft of large palmate leaves borne on the end of long petioles. Its likeness to the palm has been remarked upon frequently. The height of the fruit from the ground, after the plant has made about three years' growth, results often in the fruit being bruised and damaged when it is being picked. This difficulty can be overcome largely by pinching out the terminal growth of the young plant when it is 2 to 3 feet high. This will cause the single stem to divide into several secondary stems, all of which will bear fruit, and which naturally will not grow to such a height as it would if the plant were allowed to grow with a single stem.

Normally, the plant is of diœcious habit with staminate and pistillate (male and female) flowers produced on different plants. The flowers are produced in the uppermost axils of the leaves, and in the case of the male tree the flowers are white and are borne on the end of long pendant racemes 2 to 3 feet in length (Plate 205). These flowers sometimes are of a hermaphrodite nature, and it is on this account that they are followed at times by small elongated fruit of no value. The flowers of the female tree are more yellow in colour, are larger, of a bell shape, and are subsessile (Plates 206 and 207).

As a general rule the first crop is borne twelve to eighteen months from planting, depending largely upon the time of planting and weather conditions (Plate 208).

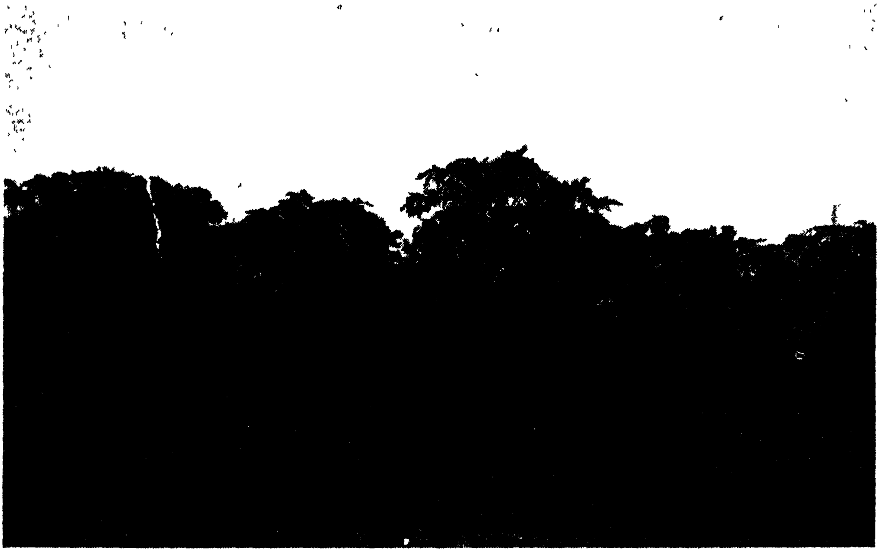

Plate 204.

A papaw plantation at Sunnybank, near Brisbane (the property of Mr. W. Parker).

The fruit of the papaw varies in shape according to the variety from spherical to cylindrical, and when mature is of a bright yellow colour. The flavour varies somewhat in different varieties, and is influenced also by the conditions under which it is produced. Generally, however, it may be described as sweet, though at times insipid, and to some demands an acquired taste. Often it can be made more palatable by the addition of sugar, lemon, or orange juice, or wine. The fruit makes a splendid ingredient in the preparation of fruit salads, and is made also into excellent sauces, jams, chutneys, &c., whilst when green, after being allowed to soak to remove the milky juice and then boiled, it is quite equal to vegetable marrow. Many claims are made for the wonderful medicinal qualities of the papaw. It is credited with possessing remarkable digestion promoting properties, as also are the seeds, which resemble watercress in flavour. An active principle known as Papain, which greatly resembles Pepsin in its digestive action, and is sometimes used as a substitute for the latter, is present in the milky sap of the fruit and in all parts of the plant.

VARIETIES.

In recent years much attention has been directed to the evolution of perfect bisexual or hermaphrodite types in an endeavour to dispense with the necessity for male trees in an orchard for the purposes of cross pollination. The late Director of Fruit Culture (Mr. G. Williams) stated in an article in the "Queensland Agricultural Journal" for December, 1931, that two bisexual varieties, the New Guinea or "Long Tom" and the Cowleyii or "New Era" introduced into the North some years ago were worthy of mention, but that the typical features by cross-fertilization had been almost eliminated. The truth that is contained in this statement is evident from a study of the fruit arriving at the markets from different districts. Modifications of these two original varieties are the most largely grown in Queensland at the present time, though the Cowleyii probably takes preference over the New Guinea type. A roundish fruit rather than a long cylindrical type is preferable for the fresh fruit market.

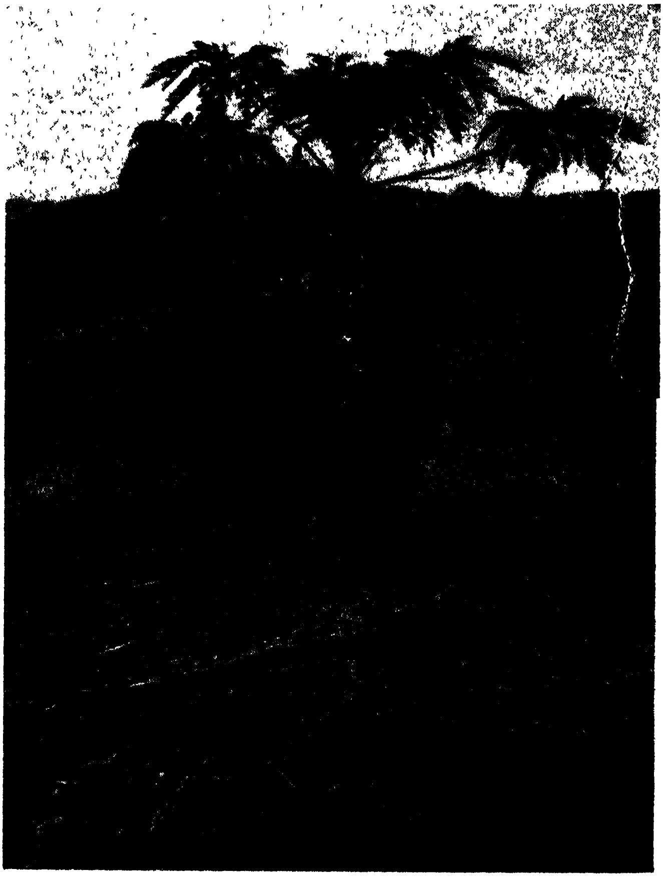

Plate 205.
Male papaw plant in flower at Brookfield, near Brisbane.

PLANTING.

It is wise for intending planters to select their own seed from large, well-formed fruit which have been allowed thoroughly to mature on the tree. The seed should be well washed in fresh water and then dried in the shade. Early spring is a good time for sowing the seed, though some growers sow early in the new year with very good results. The use of specially prepared seed-beds subjected to partial shade is the recommended practice. If the beds are kept well watered the young plants will appear in a short time, and when about 8 to 12 inches high may be transplanted to their permanent positions. When planting out, the foliage, except the young undeveloped crowns, should be removed to reduce evaporation from the plants. Here a note of caution may be sounded. If at any time during the life of the papaw plant it is necessary to remove foliage, only the leaf blade should be cut away, allowing the petiole or leaf stalk to remain on the stem. If the petiole is removed whilst green an entrance to the stem of the plant is allowed for various rot-producing fungi, whereas if it is left on the plant the latter has a

Plate 206.

Female papaw in flower and fruit (note flowers above the young fruit) in a plantation at Brookfield.

chance to protect itself by the deposition of a layer of corky bark at the junction of the petiole and stem, and no open wound is left through which disease can gain an entrance.

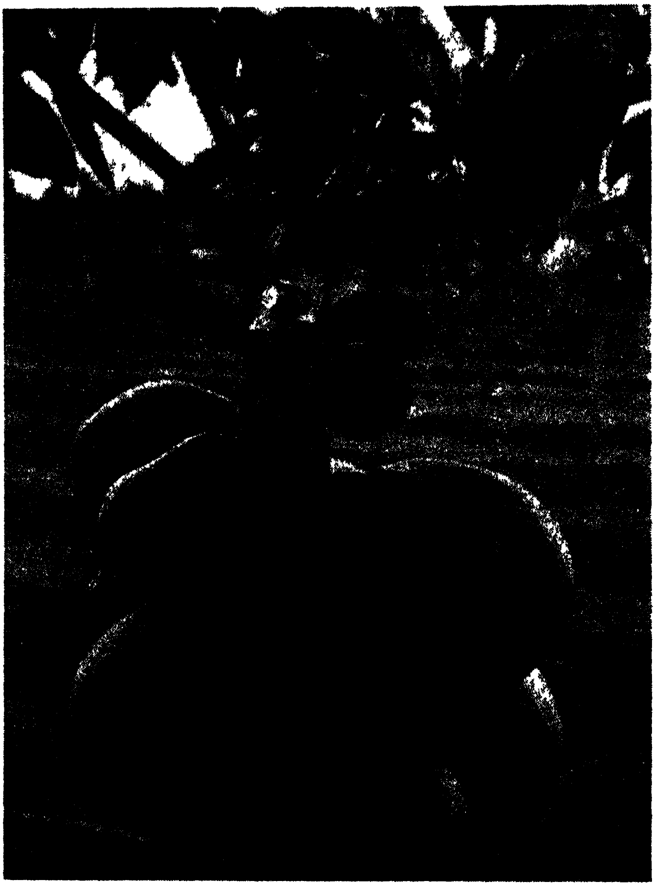

Plate 207.
Female Flowers and Fruit of Papaw.

Where young plants are grown under shade, this should be removed several days prior to transplanting, and watering should be discontinued to allow the plants to harden off, so that they will be able to get a better start when planted out. A few hours prior to digging up the plants the bed should be given a good soaking, so that the plants may be lifted easily without excessive injury to the roots. The plants should be taken up with a ball of earth adhering to the roots and planted in their permanent positions at about the same depth as that in which they were growing in the seed beds. The soil should be well-firmed about them and watered thoroughly.

In any lot of seedling plants there is always the possibility of numerous male plants being found and these, of course, are unproductive. Though many methods have been advanced from time to time as guides to enable male plants to be distinguished from female plants in the seed-bed, there are none unfortunately which can be recommended as infalliable. It, however, invariably happens that in the seed-bed a wide variation of vigour in individuals is noticeable. In practice it has been found that the stronger plants almost invariably are males; so that by weeding out these plants and leaving only the weaker specimens there is a reasonable chance of obtaining a big percentage of females. It is not suggested that by following this practice 100 per cent. of females will be secured, and as a further precaution it is recommended that in planting out, two or three plants be planted 2 or 3 inches apart in the one hole and allowed to grow (Plate 209). When the flowers appear the males and unnecessary females can be removed and one female plant

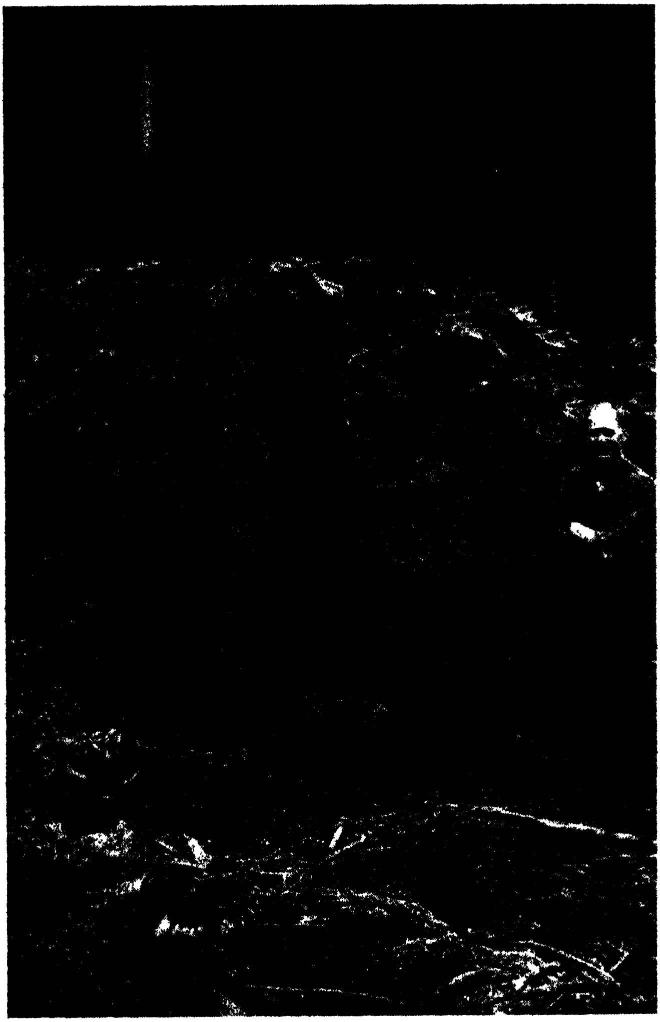

Plate 208.

Eighteen-months old papaw plant on Major Savage's plantation at Brookfield.

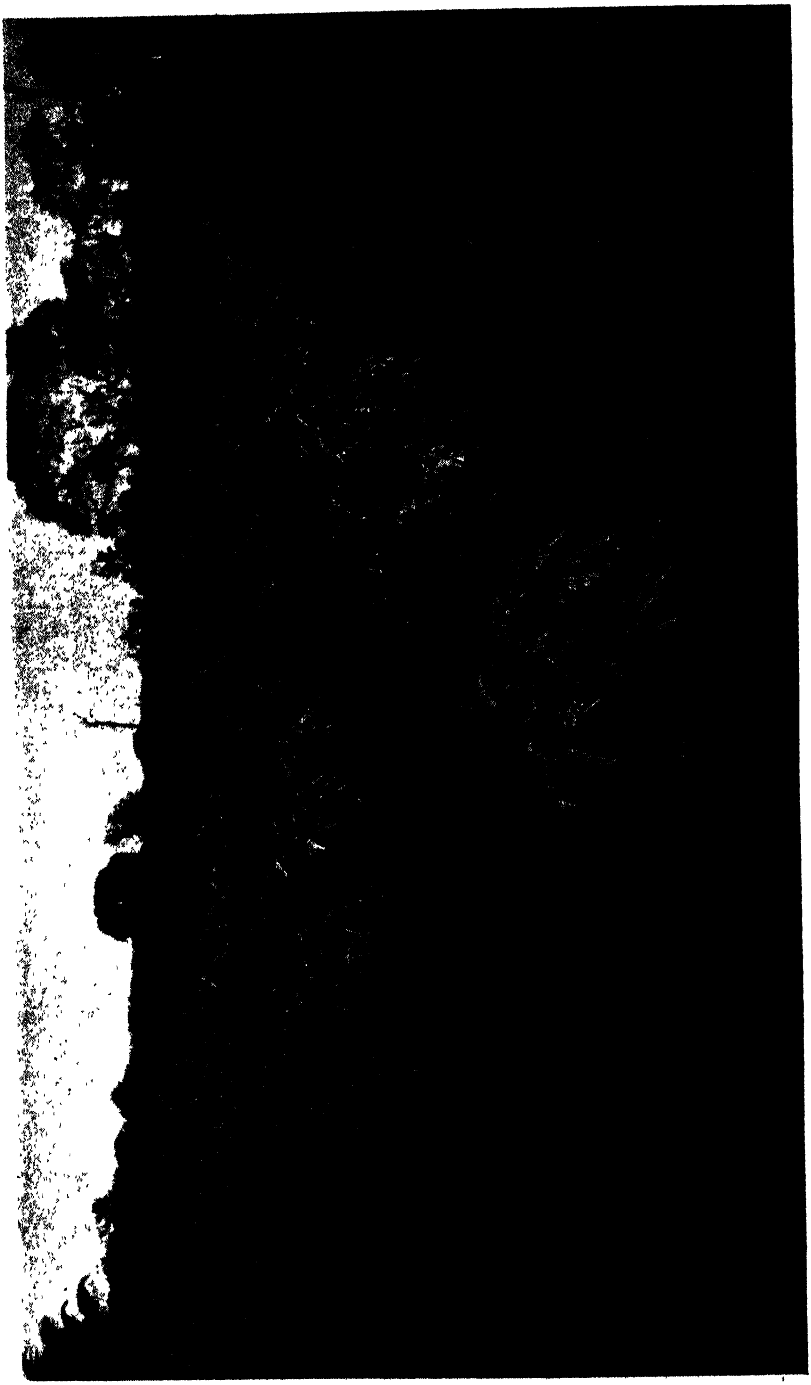

Plate 209.

Young papaw plantation, Sunnybank, showing method of setting three plants in one hole.

left in each hole. About 8 feet by 8 feet permits of 680 plants being planted per acre and is regarded as a reasonable distance apart for planting, as this enables horse cultivation to be carried on between the rows (Plate 210). After planting, however, it is important that cultivation be confined solely to the shallow breaking up of the surface soil.

SOILS AND FERTILIZING.

Whilst the papaw is not essentially a deep-rooted plant, and, provided drainage is good, will grow well on soils which are comparatively not of great depth, it is a heavy feeder, and is therefore partial to a fertile soil. If the soil is not over well supplied with plant foods, the deficiency may be made up by the addition of stable manure where available and the application of artificial manures. The Agricultural Chemist recommends the following fertilizers per acre:—1 cwt. nitrate of soda; 2 cwt. bonedust or Nauru phosphate; 1 cwt. superphosphate; 1 cwt. sulphate of potash—or 1 to 2 lb. of this mixture per tree (Plates 210 and 211).

PART II.

HARVESTING, PACKING, AND MARKETING.

JAS. H. GREGORY, Instructor in Fruit Packing.

GENERAL HARVESTING CONDITIONS.

Climate and temperature, when harvesting is in progress, are big factors in the successful carriage of papaws and other tropical fruits to local and distant markets. Every care must be taken to eliminate carelessness and the rough handling of such delicate fruit. Where possible, when removing fruit from the tree, it should be cut, not pulled. It is essential that fruit after being harvested should be allowed to cool before being packed. This is all the more important if the fruit is to be carried over long distances.

Fruit packed while in a heated condition holds the heat for a long period during transit, thus causing premature ripening or sweating, with the certainty of the consignment opening up in an over-ripe or wet and musty state, which is just the condition favourable to the development of moulds and transit rots. Fruit in this condition has to be sacrificed by the agent to distributing retailers for rapid disposal. Such sales often have a detrimental effect on the price and upon the demand for sound consignments.

By considering the time of the day and picking the fruit while its condition is unheated, precooling is made much easier. If necessary, after picking, the fruit should be spread out in a cool place to reduce its temperature before packing. A flat-topped table with the surface covered with bags or other soft material is just the thing required for cooling, and also will make a good sizing and packing bench.

Care in the selection of the type and condition of fruit for carrying long distances is necessary. Tropical fruits do not ripen satisfactorily under the usual Southern climatic conditions, which lack the warmth and humidity of the Queensland climate. This makes it necessary to allow papaws for those markets to mature on the tree as much as possible before harvesting. During the winter months fruit can be allowed to colour more than in summer without affecting its carrying quality. It is necessary to allow the fruit to hang for the extra period if it is to be supplied to the Southern consumers in the best possible condition.

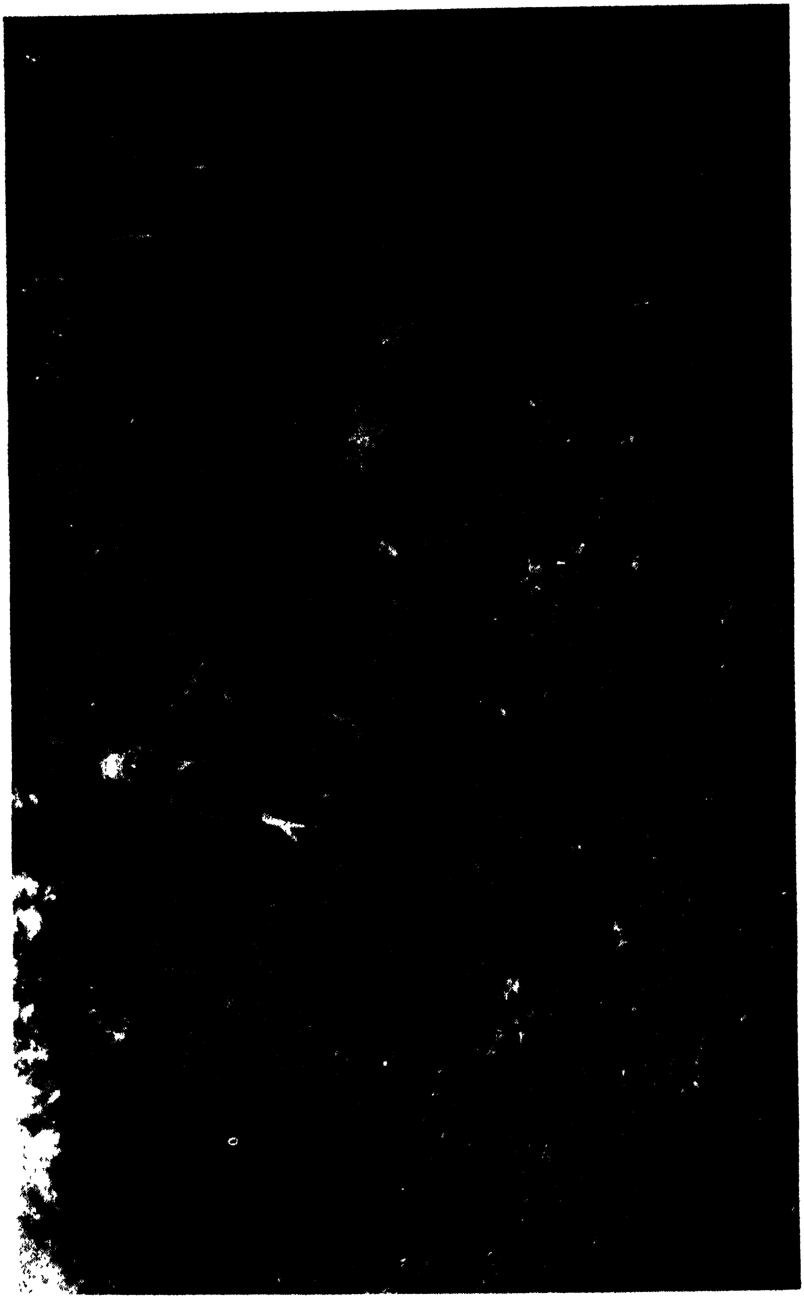

Plate 210.

Young hillside plantation on Major Savage's property at Brookfield. Note that plants are also set out in groups of three.

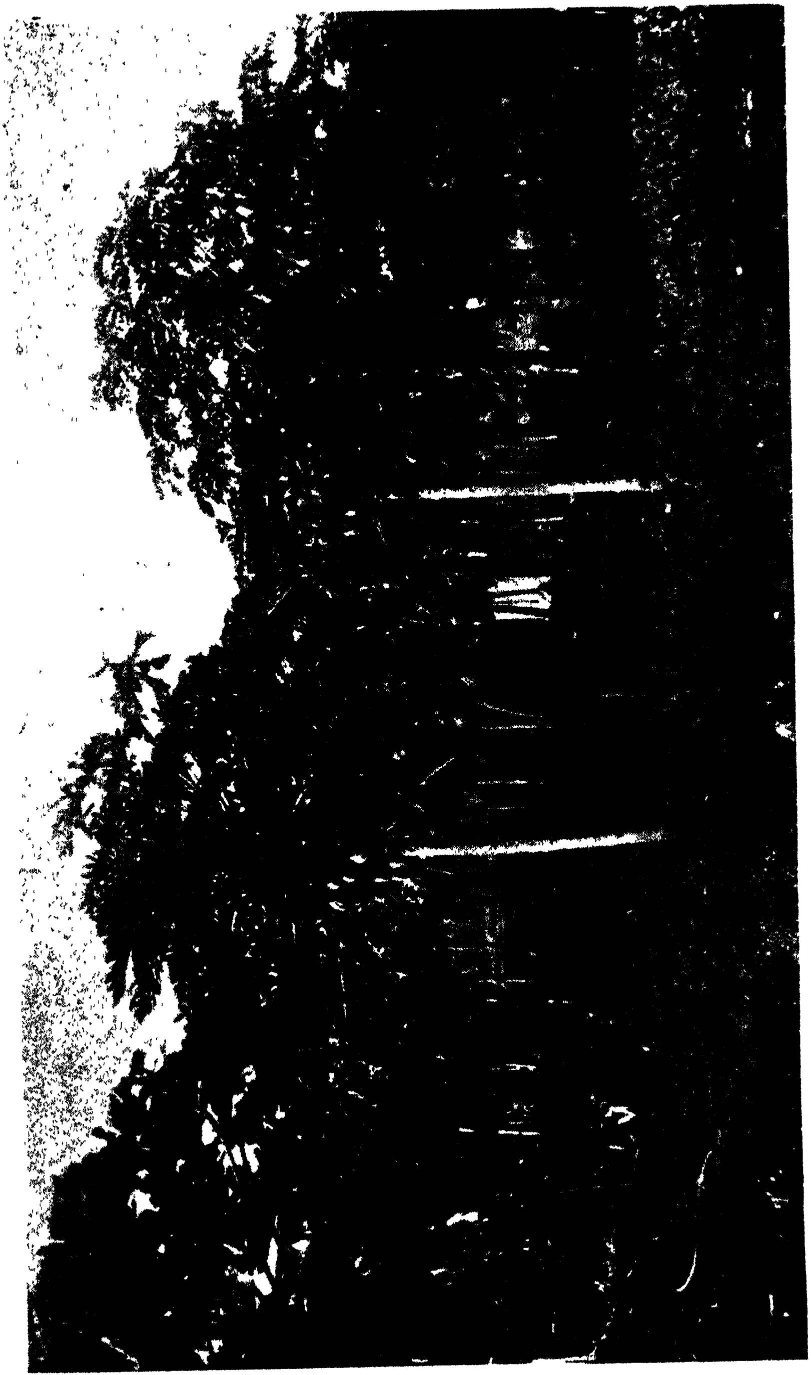

Plate 211.

Papaws Growing in a Chinaman's Garden at Redlynch, North Queensland.

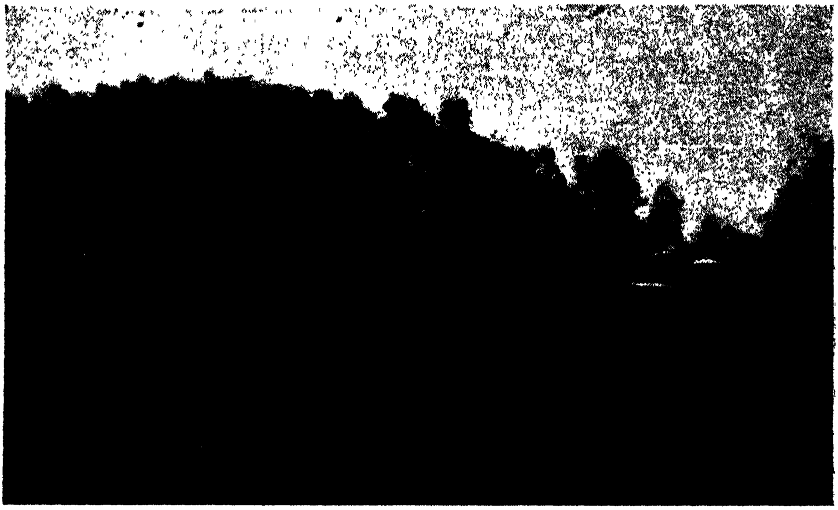

Plate 212.
A Hillside Plantation, Brookfield.

Summer conditions require more care, the fruit not being allowed to advance in colour to the same extent. There appear to be two types of papaws, the one soft-fleshed when ripe, the other firm-fleshed. For average types of soft coloured varieties, the fruit in summer should show one-quarter colour, and in winter one-half. The firmer-fleshed type of papaw can be allowed to colour to an even greater extent before harvesting. Preference should be given to this type of fruit when sending it to distant markets. At the same time, care should be taken not to send the "soapy" type of fruit which never ripens satisfactorily. Removing

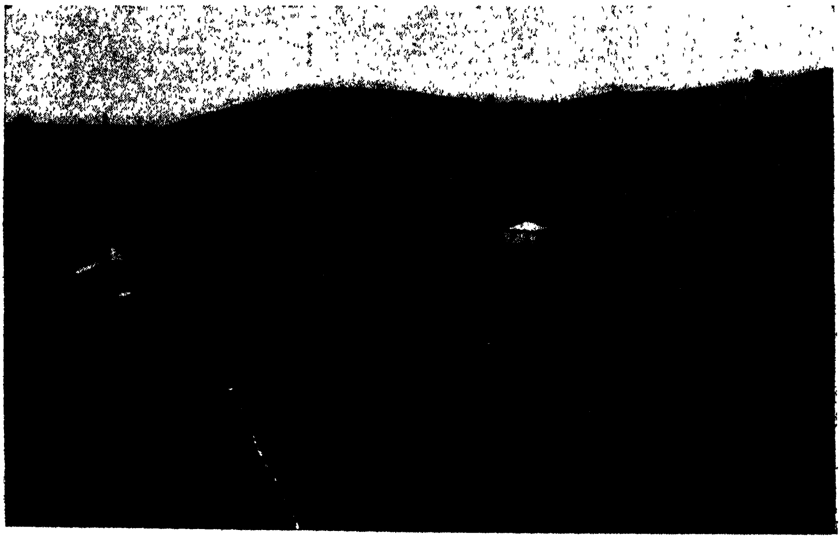

Plate 213.
Another Brookfield view of hilly country and planted slopes.

trees which give unsuitable fruit from the plantation is well worth while. Only observation on the part of the grower can determine the actual method to use for his own particular product. No positive method of procedure can be given to growers in this respect, only a general guide, but this, plus the use of common sense, should enable a good product to be placed on the market. Brisbane, Sydney, and Melbourne markets each need slightly different treatment on the lines suggested. The need for placing a first-grade article on the market cannot be stressed too greatly. Queensland growers have the market for tropical fruits completely to themselves, there being no competition from the other States. The importance of these markets therefore can be readily seen. The demand for our tropical fruits is as yet only in its infancy. It should be remembered that the Melbourne and Sydney markets do not want green papaws. Green papaws are unsaleable at any time and usually finish up by being damaged by fungus before they ripen to an extent that renders them only fit for the rubbish tip.

TROPICAL FRUIT CASE.

The best container for the long-distance carriage of papaws is the tropical fruit case, 24¾ inches long by 12 inches wide by 12 inches deep (Plate 214). Woodwool is the most satisfactory packing. The box is prepared by placing a layer of woodwool on the bottom of the case and around the ends and the sides. Each papaw then is wrapped in soft paper or cellophane and placed in a single layer in the prepared box, using small pads of woodwool to separate and make the individual fruit firm and snug. A thin layer of woodwool then is placed over the top of the layer of fruit, and the process is repeated until the case is full, finishing off with a layer of woodwool packing on the top. It is unwise to have the fruit projecting too far above the top of the box, but the lid of the case should press just firmly enough to keep the fruit snug and firm. Packers should avoid placing too much padding in the case; care in matching the various-shaped fruit will greatly assist in this. By using a coloured wrapper in conjunction with the woodwool a very attractive package can be placed on the market. Care in eliminating all green, over-ripe, or diseased fruit when packing is absolutely necessary to ensure safe transit and satisfaction to buyers. Cases when packed should not contain any fruit that will shake about whilst travelling.

PACKING FOR DISTANT MARKETS.

In packing papaws the aim should be to give the maximum protection to the fruit in transit, and to pack the fruit in such a way that it will display to the best advantage when opened and exposed for sale. Before being packed the fruit should be cooled and sized. To assist in making the operation of packing easier, an effort should be made to match the various-shaped papaws whilst sizing them into heaps. Four sizes should be sufficient to cover the packing of papaws for export. As with custard apples, sizing is done easily on a flat-topped table covered with soft bags or other suitable material. Many growers do not think it necessary to go to this trouble, failing to appreciate that the skin of the papaw is exceptionally tender, and that the slightest scratch will cause the fruit to bleed, thus damaging its appearance.

When being sent to Southern markets extremely large sizes of fruit should not be packed, as they are not favoured by buyers. When large fruit is packed and one or two specimens in the cases arrive in faulty condition, it creates a heavy loss such as is not likely to be incurred if only the medium and smaller sizes are used.

When packing papaws for distant markets the maximum protection is given to the fruit by placing the hardest part of the fruit, so far as is possible, to the sides of the case. An examination of a ripe papaw will disclose that the softest part of the fruit is at the opposite end to the stalk. When packing, the soft pointed end of the fruit is protected by placing to the centre of the box, with the stalk end to the outside of the box, where the ill effects of handling are most likely to be felt. With extra large fruit this cannot always be done. Plate No. 214 shows a method that is of assistance in good carriage. Careful attention to these details assists greatly in reducing damage during handling.

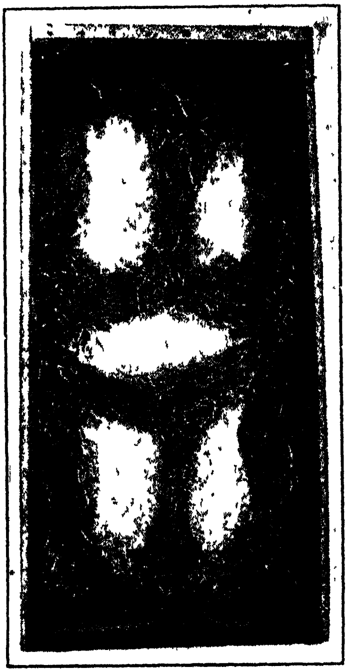

Plate 214.

LARGE PAPAWS PACKED FOR EXPORT.—The fruit is wrapped in soft tissue paper and nested in woodwool. The case used is the tropical fruit case, 24¼ in. by 12 in. by 12 in.

Papaws should never be pressed on their sides by thumbs or fingers to ascertain whether they are ripe. A gentle pressure of the hand at the stalk end will reveal the state of ripeness to the experienced packer without damage to the fruit.

PACKING FOR LOCAL MARKETS.

Growers who are near enough to their markets to be able to use motor transport have a decided advantage over those who have to send fruit over long distances. In the former case, the fruit can be left on the tree to become almost fully ripe before being sent to market, and it is not necessary to pack in the same manner as when sending further afield. Close attention should be paid to the elimination of all disease-infected or marked fruit, and sizing also should be rigidly adhered to. The Australian dump case, made in the form of a tray, 18 inches long by 14¼ inches wide by 8⅔ inches deep, is a good container for the local market (Plate 215). The fruit is packed on end in a single layer resting on a layer of woodwool or similar packing. As a protection against rubbing the bottom end of each fruit, it should be wrapped for about two-thirds of the way in clean, plain white or coloured paper, while each fruit is made snug and tight by pushing pads of woodwool in between the fruit. Papaws packed in this way have a very attractive display value, and sell much more readily than those carelessly placed in cases without packing, the buyer being able to appreciate the quantity and quality at a glance.

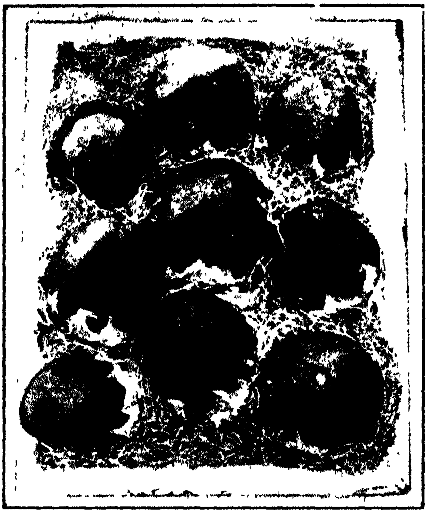

Plate 215.

Papaws Packed for Local Market.—Packed in the Dump Case used as a tray by removing the side; 18 in. long x 14¼ in. wide x 8¾ in. deep. Note the wood-wool padding between the fruit.

CARE IN MAKING CASES.

Growers, after taking every care in handling their fruit while harvesting and packing, often, through carelessness in making and nailing down cases, offset an advantage already gained by careful handling. Careless nail-driving, causing nails to protrude inside the box from the timber of the case, often results in damaged fruit, with consequent waste. Nail-marked fruit decays, breaks down, and affects adversely the sound fruit in the box. Nails protruding through the outside of a case are a danger to all handling it in transit, often causing bad cuts or loss of temper, and rough handling in consequence. Extra care in such matters is well worth while, and saves trouble.

THE "GET-UP" OF THE PACKAGE.

Attractiveness is the main feature to be studied, as anything added or done to make the produce worth more to the buyer is a big factor in obtaining quick sales and higher prices. The following points are well worthy of consideration:—

Use only clean, well-made cases. Second-hand cases often carry insects and fungus diseases.

Plain white or coloured paper is much more attractive and cleaner than newsprint, while the extra cost is only a fraction of a penny per case.

Where it is necessary to use packing, clean woodwool is preferable to most types of grass and other packing.

Fancy labels are an improvement, but if stencils or rubber-stamps are used care should be taken to apply them neatly and so avoid smudging and spoiling the appearance of the finished package. The packer's full name and address, with the variety and contents of the case, as required by the Fruit and Vegetable Acts, should be embodied in labels or stencils. Cases should always be stencilled or labelled clearly with the name "Papaws." Labels suitably printed can be obtained.

When sending long distances wiring the cases is an improvement, and is an economy and insurance against rough handling. Wiring also is an attraction to the buyer who desires to despatch fruit to distant places.

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THE CHOKO.

The choko is a popular vegetable, grown largely in Queensland for both market and home use. It has the advantage that, once planted, it comes into bearing each year from the original root. The plant will die down only during the coldest months, and in the spring will shoot again from the tuber which is formed under the ground.

The choko requires a rich, loamy soil to which has been added a heavy dressing of well rotted stable manure. Additions of dried blood and bone dust, or of manure during growth, are of great benefit, as, being a perennial and a heavy feeder, the choko's food requirements are considerable.

The method of planting the choko differs a great deal from that used for other varieties of the same family. Whole choko fruits are used as planting material, the growth coming from a shoot from the kernel in the fruit. The fruit should be planted on the side with the broad end sloping downwards and the stem end slightly exposed.

A trellis is essential to satisfactory growth, though, if planted near a fence or old stump, the plants will spread over it very quickly. When chokos are grown commercially it pays to erect a suitable trellis. This may be done with good logs or rough timber. Sometimes an ordinary "T" trellis is used, over which strong fencing wire is stretched.

A good permanent trellis may be constructed as follows:—Two rows of strong posts are set firmly in the ground with a height of about 6 feet 6 inches above the surface, the rows being about 9 feet apart and the posts about 8 feet apart in the rows. The tops of the posts support cross timbers on which strong fencing wire is stretched with about 18 inches between the wires to carry the vines. Stays support the outside posts, and wires for trellising also should be stretched upon these.

The choko takes some months to come into full bearing, but will commence to bear fruit generally some four to five months after planting. The plants appear to improve with age when properly cultivated and manured.

There are two varieties, the green and the cream. The cream-coloured variety is the more popular.

Choko should be picked fresh and, after having been peeled, should be cut into suitable portions and boiled or baked.

—*C. N. Morgan.*

Tomatoes in the Central District.

W. J. S. SLOAN, B.Sc.Agr., and W. J. ROSS.

WITH the higher level of prices which usually operates from September to December, the tomato crop assumes greater importance to the farmers in the tomato-growing areas of the Central district. This period coincides with an increased incidence of pest and disease troubles. Particular attention, therefore, should be paid to the cultural requirements of the plants and to pest and disease control in order to prolong the bearing period.

Normally with tomato patches on scrub burns, weeds do not trouble the young crop unduly; but it is advisable to check the weed growth which sometimes becomes serious at picking time. The soil around the base of the plants should be kept loose, at the same time, with the hoe. In cultivated areas, the land should be kept well stirred and free of weeds, which both rob the soil of valuable moisture and encourage the breeding of pests such as the corn-ear worm and the tomato mite.

Old plants may be cut back profitably if the root systems are reasonably sound and a bunch of fresh growth is shooting from the main stem. If excessive, this flush of new shoots may be thinned lightly. Severe thinning is undesirable, as it is necessary to retain sufficient foliage to keep a reasonable balance between the root system and the parts of the plant above the surface.

A handful of a 4:11:10 chemical fertilizer, containing sulphate of ammonia, superphosphate, and sulphate of potash, should be applied to old plants and backward young plants, in order to stimulate new growth and blossoming. When the first fruit has set, a dressing of 50-60 lb. of sulphate of ammonia per acre will help to keep the plants moving.

Tomato mites spread rapidly as the warm weather approaches, and quickly cause a dying-back of the foliage from the centre of the plant. Loss of foliage exposes the stems and the fruit to the hot sun with harmful results. For the control of the mite the plants may be sprayed with lime sulphur at a strength of one in eighty. Alternatively, a dust composed of flowers of sulphur and a good quality hydrated lime in the proportion of 1:1 can be used. If mites already are numerous on the plants, spraying is preferable to the dusting. However, if the plants are treated with a sulphur-lime dust from the seed-bed onwards, a satisfactory control of the mites will be obtained.

Damage by the corn-ear worm also increases rapidly in the spring, and may be the cause of heavy losses of fruit if not checked at an early stage. Lead arsenate is the most reliable insecticide for this pest, and may be used as a spray or dust. A suitable spray can be prepared by adding 3 lb. of lead arsenate to 100 gallons of water and including a spreading agent. If mites are troublesome at the same time, colloidal sulphur may be included with the lead arsenate. As a dust, the lead arsenate is used diluted 1:1 with either a good quality hydrated lime or sulphur, the latter diluent having the additional advantage of controlling the mite.

Lead arsenate leaves an objectionable spray residue, and should not be used after the plants have commenced to fruit. Constant attention to the control of the corn-ear worm up to this stage, however, gives an excellent chance of a reasonable crop.

Leaf diseases and black spot on the fruit frequently appear as the plants age and lose their vitality. Correct manuring, cultivation and pest control all help considerably to prolong the life of the plant.

When a fungicide is necessary, either a Bordeaux spray or a copper dust may be used to hold the diseases in check. To control pests and diseases with a combination spray, lead arsenate and a colloidal sulphur preparation may be added to the Bordeaux. Lime sulphur cannot be included in sprays containing either lead arsenate or Bordeaux, as such mixtures are liable to injure the plants.

Various proprietary dust mixtures containing lead arsenate, sulphur and a copper compound are marketed for the purpose of controlling pests and diseases in one operation.

THE EGG PLANT.

The egg plant is easily grown and produces an excellent culinary vegetable. It is grown similarly to the tomato, and like that plant is very sensitive to cold. It requires a light, rich, loamy, well-drained soil, and poorer ground may be improved by the addition of a 1 4 1 mixture of sulphate of ammonia, superphosphate, and sulphate of potash at the rate of about 5 cwt. to the acre, or by heavy dressings of well rotted stable manure to which a small quantity of superphosphate has been added.

For an early crop the seed may be sown under cover during July and August; and, when all danger of frost is over, the plants should be set out about 2 feet apart in rows 3 feet apart. Difficulty may be experienced with transplanting, and, it is sometimes desirable to sow the seed in the permanent positions for the plants after all danger of cold weather has passed.

Cultivation and plenty of water are necessary for the plants, as they do not recover readily after a check in growth. Staking in a similar manner to tomatoes may be practised, while, as soon as the fruits are formed, they should be thinned out to leave only eight or ten to each plant. The fruits are harvested when from 4 to 6 inches in diameter. The time from seed planting to transplanting is approximately two months, and from seed planting to mature fruit five months. The best variety is the New York Purple Spineless.

For cooking the fruit should be cut into slices and fried in batter, the slices having been covered first with salt. If being boiled or baked, the fruit should be seasoned with butter, pepper, and salt.

—*C. N. Morgan.*

PRUNING GRAPE VINES TO AVOID INJURY BY SPRING FROSTS.

Spring frosts occasionally cause considerable damage to vineyards, especially in the inland areas of high altitude. Vines which are the first to come into leaf naturally suffer most, as the dormant vines are injured only in exceptionally extreme cold. Many cases have been brought under notice where the entire crop of a vineyard has been ruined overnight by one late frost, while an adjoining area, in which the vines had not commenced to sprout, has been quite unharmed.

Vines that have been pruned in the late autumn and early winter are the first to come into leaf, and naturally are more susceptible to injury by frost than those pruned in the late winter or early spring.

Many vignerons practise early pruning, the desire being, no doubt, to have the job finished and so leave themselves free for other work. It is true that late pruning comes often at an inopportune time, conflicting with other spring work on the farm; but where a grower is considering his income he must, if at all possible, arrange pruning operations to minimise frost injury to his vines.

The work can be simplified to a great extent by a modification of the usual practice by which the pruning is carried through in one operation. Instead of completing the pruning by mid-August, which, for instance, would be a wise procedure in the Stanthorpe district, a preliminary pruning could be made in June, which would consist of shortening the canes back roughly to, say, nine eyes above the main arm or spur, and removing the prunings from the land. Then, just before the buds commence to swell in the spring, the rods that have been left on the vines can be shortened back to the required length.

Young vines that have been budded in the previous summer should never be pruned early, for, being close to the ground, the young growth is much more susceptible to injury than that of more mature vines higher up on the trellis wires.

—*F. L. Jardine.*

Cucumber-growing.

C. N. MORGAN, Fruit Branch.

THE warmth of the climate makes this crop a very suitable one for Queensland. In the coastal and northern districts several crops can be grown during the season.

Planting is carried out usually in the southern coastal districts from September to January, and on the tablelands from October to January; in the northern districts, on the coastal areas from July to January, and on the tableland and inland areas from August to January.

The Agricultural Chemist, in his pamphlet on "Complete Fertilizers," states: Cucumbers may be grown on almost any soil so long as it is fairly light and loamy and plenty of manure is added. The pits or hills should be prepared by mixing a large amount of well-rotted stable manure, sheep or fowl dung, ashes, and bonedust with the soil. Apply in addition the following artificial fertilizer:—

1½ cwt. sulphate of ammonia or nitrate of soda;

3 to 4 cwt. Nauru phosphate—superphosphate mixture;

1 to 1½ cwt. sulphate of potash;

or 6 to 8 cwt. of a 5-12-5 mixed fertilizer per acre, or 2 to 3 oz. of the same mixture per square yard.

The terms "pits" or "hills" are used to represent groups of four or five plants. At one time the seed was sown always on hills raised above the ground level, but unless the ground is badly drained this practice need not be followed.

Four or five plants are sufficient to a "hill," and the seeds should be placed 3 or 4 inches apart and about 1 inch below the surface. The "hills" should be about 4 feet apart each way, and the whole surface left loosely cultivated.

Should the plants send out their runners to a distance of 2 or 3 feet without setting cucumbers, fruiting may often be induced by pinching out the tips of the runners.

Cucumbers should be harvested when nearly full grown, before the seeds harden and the skin begins to turn yellow.

The time from planting to harvesting is usually about three months, and 1 lb. of seed set out as directed will plant an acre.

The varieties recommended are: For market purposes, Imperial White Spine; for pickling, Early Green Cluster.

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THE FARM ORCHARD.

Where there are young children in a family particularly a good supply of fresh fruit and vegetables is a necessity, if there health is to be maintained. Even if some expense is involved in making a farm orchard garden, it is well worth the cost. A well-kept garden, and a home surrounded by trees is a decided asset to any farm, and undoubtedly enhances its value.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

CONTINUOUS dry weather is still causing complications in the marketing of fruit. High prices have been maintained for many fruits, but a drop will soon ensue if growers do not cease sending small poor-quality fruit.

The price for bananas has reached the highest level for many seasons, but growers may expect a sharp decline in the near future if the practice of marketing immature fruit is allowed to continue. Thin, angled fruit is never in demand and slows up sales, causing an accumulation of stocks with a consequent price easement for all lines.

Growers are reminded, too, that cutting fruit too soon has the effect of greatly reducing the ultimate output of the plantation. Certainly at this period of the year most plantations will have a proportion of bunches that have fallen out or have had to be harvested from dead stools, but at the same time this does not give the right for a consignment to be composed completely of immature, angled fruit. In the last few weeks many consignments have been condemned for this fault.

Many reports of the incidence of "squirter" have been received. Squirter and black-end can be practically eliminated by the adoption of cluster packing. It is well to remember that it is the grower who pays for all faults noticeable on the market, not the agent.

Pineapple quality has improved, less green fruit being noticed, and values have remained steady but at lower levels than a few weeks ago. Growers are advised to cut all fruit for distant markets.

With the approach of the warmer weather consignments of papaws will have to be watched more closely, and care in the selection of firm, coloured fruit will need to be exercised. Summer consignments should not show more than about one-third colour for most types. Unfortunately, no fixed rule can be given, since papaws vary in type—some being highly coloured and some green when ripe. There also are apparently both hard and soft types. Consignors to Southern markets are urged to study their plantations and select the trees which produce the best types of fruit for distant carriage. Remember that the taste for tropical fruits has still to be developed in the Southern States. As Queensland has the means for unlimited production of these fruits with no competition to meet, it is all in our interests to foster this trade.

Southern apples are giving trouble on the Brisbane market. Southern shippers should realise that the weather in Queensland is now becoming warmer, and that apples sent from cold stores in the cooler Southern climates do not hold long in good condition in Queensland at this time of the year Only varieties such as Yates and Tasma should now be sent. Jonathans and Sturmers of any size will inevitably cause trouble and loss.

Market prices for the month:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Eights and nines, 17s. to 21s. per case. Sevens, 11s. to 19s 6d. per case. Sixes, 12s. 9d. to 17s. 6d. per case. Smalls, 9s. to 15s 6d per case.

Sydney.—Eights and nines, 22s. to 24s. per case. Sevens, 19s. to 22s per case. Sixes, 15s. to 19s. per case. Thin fruit hard to move.

Melbourne.—Eights and nines, 23s. to 24s. per case. Sevens, 21s. to 22s. per case. Sixes, 19s. to 20s. per case. Thin fruit slow of sale.

Pineapples.

Brisbane.—Smooths, 5s. to 8s. per case; loose, 1s. 6d. to 7s. per dozen. Ripleys, 8s. to 11s. per case; loose, 2s. to 7s. per dozen.

Sydney.—Smooths, 8s. to 11s. per tropical case.

Melbourne.—Smooths, 8s. to 10s. per tropical case; a few special lines higher.

Papaws.

Brisbane.—Yarwun, 7s. to 11s. per tropical case; locals, 2s. 6d. to 6s. per bushel ease; Gunalda, 5s. to 6s. per bushel case.

Sydney.—10s. to 13s. per tropical case.

Melbourne.—10s. to 14s. per tropical case.

Mangoes.

Mangoes have made their appearance on the market. Many consignments give the appearance of having been harvested with a stick, shillings a case being lost in the price.

Brisbane.—7s. to 8s. per case; inferior, bruised, and soft fruit lower.

Passion Fruit.

Brisbane.—6s. to 12s. per half-bushel; specials, to 14s.

Sydney.—6s. to 9s. per case; inferior fruit hard of sale.

Melbourne.—4s. to 12s.; specials higher.

Strawberries.

Brisbane.—4s. to 6s. per dozen boxes; specials, to 9s.

Sydney.—Trays, 3s. to 5s. each; boxes, 9s. to 12s. per dozen.

CITRUS FRUITS.

Oranges.

Brisbane.—Valencias, 5s. to 8s. 6d. per bushel; second crop, 4s. to 5s. per bushel; Gayndah district, 9s. to 10s. per bushel.

Sydney.—Valencias, 4s. to 7s. per bushel.

Melbourne.—Navels, 6s. to 8s. per bushel; commons, to 10s. for specials.

Lemons.

Brisbane.—Locals, 4s. to 8s. per case; Gayndah, 8s. to 13s. per case.

Sydney.—Locals, 3s. to 6s. per case.

Melbourne.—4s. to 7s. per case.

Grape Fruit.

Brisbane.—4s. to 9s. a bushel.

Sydney.—4s. to 10s. a bushel.

Melbourne.—6s. to 12s.; specials higher.

Mandarins.

Brisbane.—King of Siam, 5s. to 8s.; Waratah, 5s. to 12s. Other varieties and small fruit hard to sell.

Apples.

Brisbane.—Jonathan, 6s. to 9s.; Granny Smith, 5s. to 9s.; Sturmer, 4s. to 7s.; French Crab, 5s. to 7s.; Crofton, 7s. to 10s.; Yates, 5s. to 9s. Many lines are not holding well, particularly the softer varieties.

Pears.

Brisbane.—Coles, 9s. to 15s. per bushel; Nelis, 7s. to 12s. per bushel; Josephine, 9s. to 13s. per bushel.

All pears should be wrapped and handled as little as possible when packing, as at present a strong tendency to go specky is noticeable.

Custard apples and avacadoes are now off the market.

OTHER FRUITS.

Cape Gooseberries.

5d. to 7d. per lb.

Tomatoes.

Brisbane.—Good, ripe 7s. to 9s. per half-bushel; inferior, down to 4s. per half-bushel; green matured, 4s. to 10s. per half-bushel; coloured, to 12s. per half-bushel.

Sydney.—Yarwun, to 10s. per half-bushel; Bowen, 6s. to 10s. per half-bushel; Southern Queensland, 12s. to 13s. per half-bushel.

Bowen growers would do better if packing in the dump half-bushel case were adopted.

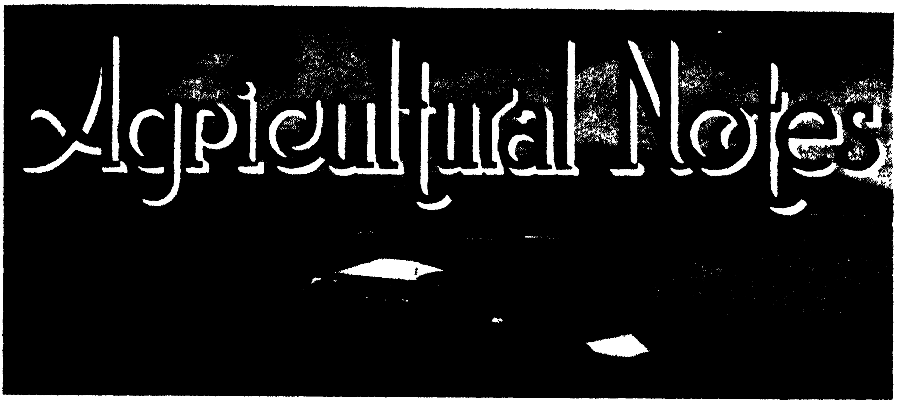
Melbourne.—Adelaide Hothouse, 18s. to 22s. per half--bushel; West Australian, 12s. to 18s. per half-bushel.

Vegetables.

Brisbane.—Beans: 4s. to 6s. a sugar bag. Peas: 4s to 6s a sugar bag Lettuce: 6d. to 1s. 3d. dozen. Cucumbers: Bowen, 5s. to 7s. per bushel; locals, 4s. to 11s. per bushel.

Publication.

"Strawberry Packing" is now available for distribution.



Seasonal Sowings.

C. J. McKEON, Director of Agriculture.

LAND prepared for summer-growing crops can be sown now with a variety of fodder, hay, and grain crops—such as maize, sorghum, millet, Sudan grass, and cowpeas. The majority of farmers recognise fully the necessity for making provision for recurring dry spells, and also for the winter months, when the growth of natural pastures is retarded considerably. In favourable seasons good results can be obtained by the cultivation of winter cereals and legumes; but it is to the more vigorous growing summer crops that stockowners must look for the provision of their chief requirements in hay, fodder, and silage.

MAIZE.

Maize can be grown successfully on a great variety of soils within the 30-inch rainfall region, deep alluvial soils being particularly suitable for its full development. Land ploughed deeply during the winter should be in good condition just now as a result of cross ploughing and harrowing; and it is well to remember that no amount of inter-row cultivation will undo the effects of sowing on hastily prepared land.

Maize crops usually are termed early or late, but as sowings may take place from August to late December, no definite sowing period can be recommended, weather conditions being the governing factor.

For grain purposes, the chief essential is to assure adequate moisture during the tasselling stage. Nine to 10 lb. of sound seed to the acre will be found sufficient, sowing in rows 3 feet 6 inches to 4 feet apart; but for fodder or silage purposes double this quantity may be used, choosing a leafy variety such as Reid's Yellow Dent.

SORGHUMS.

The sweet or saccharine sorghums also are widely grown throughout the dairying districts, as they provide a large bulk of nutritious and palatable fodder.

Although slightly less nitritious than maize, the sorghums will withstand dry conditions much better, while they also retain their succulence for a period after maturity, making them specially valuable as early winter feed. In cultural requirements the crop is somewhat akin to maize, sowing being done in rows 3 feet to 3 feet 6 inches apart, which will be found to utilise approximately 5 lb. seed per acre. Sorghums frequently are sown broadcast; but although a finer stalk is produced, the total yield is reduced often by this method, besides which, weed growth is apt to be troublesome during the early stages of growth.

For silage purposes sorghum should be cut when the grain is well formed yet still in the soft dough stage. Saccaline, Imphee and White African are popular varieties.

MILLETS.

Where a quick-growing summer grazing or hay crop is desired, the millets can be recommended confidently, as they will produce fair crops even on the poorer soils.

The seed usually is drilled or sown broadcast, at the rate of 12 to 15 lb. per acre, and under favourable conditions the resulting crop will provide good grazing within five or six weeks. However, it is preferable to exclude stock until the plants are 8 inches to 9 inches high, when the roots will have a sufficiently strong hold to withstand grazing.

For hay purposes millets should be cut when the grain is in the soft, doughy stage; and, if a binder is used, small sheaves should be made and stooked in windrows. The varieties known as Japanese millet and white panicum have given the best results.

SUDAN GRASS.

Sudan grass also is excellent for grazing or silage purposes, and is considered to be the best possible summer crop for the drier farming areas, such as the Western Downs and Maranoa.

It is better to drill in the seed, using approximately 8 lb. per acre; but for broadcasting double the quantity will be required. The risk incurred in allowing stock access to Sudan grass prior to the flowering stage has been stressed often; however, the risk is taken by many experienced stockowners who have fed the crop during all stages of growth without ill-effects. Sudan grass and other members of the sorghum family cross fertilize readily, and the resultant hybrids are likely to cause poisoning; consequently, care should be taken to obtain pure seed from a reliable source.

COWPEA.

The cowpea now is widely recognised as a valuable green manure crop, resulting in the development of a good trade in locally-grown seed. Its profitable utilisation as a fodder crop is also receiving attention by progressive dairymen, as it is highly nutritious, provides a good bulk of fodder, and is valuable as a rotation crop. Stock can be readily accustomed to green cowpea by sowing in conjunction with maize, either in the maize drills or in alternate rows. The seed varies greatly in size according to variety; so that, when sown in drills 3 feet apart, from 5 to 15 lb. seed per acre will be necessary Poona, groit, black, and brabham are popular varieties.

With all spring-sown crops much better results are obtained when inter-row cultivation is carried out thoroughly, although, as previously pointed out, the initial preparation of the land, involving winter fallow, is of primary importance.

Cutworms in Seedling Cotton.

W. J. S. SLOAN, B.Sc.Agr., Assistant Research Officer.

DURING the spring and early summer months one of the most serious pests of seedling cotton with which the farmer has to contend is the common cutworm.

In years of cutworm outbreaks the loss of stand may necessitate replanting. Replanting is successful only when the soil contains adequate soil moisture, and some time may elapse between a cutworm outbreak and the resowing. Late replant crops are rarely so successful as those sown early, and for that reason precautions should be taken against cutworms to ensure a commercial stand of cotton with the first seeding.

The winter of 1937 has been more or less favourable for the insect, and it is possible that good spring rains will be followed by a widespread emergence of moths. Farmers therefore should be familiar with the habits of the pest and the methods used for its control.

The cutworm—the larva of a dark-brown moth—is a stout, soft-bodied greyish-brown to greyish-green caterpillar growing up to 1½ inches in length, which feeds principally on low-growing weeds. When these food supplies are disturbed in any way, the caterpillars may migrate to nearby cotton fields or, if already in the paddock, may damage the germinated cotton. The pest feeds at night and normally attacks the stem just above the ground level.

Cutworm losses in cotton may be considerably reduced by a good cultural system. Thorough ploughing, in which weeds are destroyed completely, is necessary. Patches of weeds missed during ploughing frequently are the centre from which extensive cutworm damage may radiate. Ploughed land should be kept free of weeds for at least a month before the planting, which, if the rains are suitable, will be carried out between mid-September and mid-October. Early ploughing is therefore required. After planting, weeds should be kept in check.

If weeds are ploughed under immediately prior to planting, the risk of cutworm injury is increased greatly, for many of the eggs and larvæ on the weeds will survive and attack the cotton seedlings.

Virgin land, or Rhodes grass paddocks which are being prepared for cotton, usually contain little weed growth, and this, to a great extent, minimises the risk of cutworm injury. Under these conditions, a later planting may be made without incurring severe seedling losses. Even in these cases, however, early ploughing is preferable, in order to ensure the preparation of a good seed-bed, and to allow adequate time for the organic matter to break down.

Where direct control of the cutworms is required, insecticides must be used. The poisoned bran bait method has been tested thoroughly, and is recommended as a reliable control measure.

To prevent the entry of invading swarms, the use of one or more baited furrows is necessary. When the pest is within the field, the bait may be broadcast or applied in lines along the rows of cotton seedlings. If broadcast, about 50 lb. dry weight of bran will be required per acre; if distributed along the rows, 25-30 lb. dry weight of bran per acre should be sufficient for baiting purposes. The formula of the poison bran bait is as follows:—25 lb. bran, 1 lb. Paris green, 2 quarts of molasses, and enough water (2-2½ gallons) to make a friable, crumbly mash which can be broadcast without difficulty. The bran and Paris green are first mixed dry; the molasses is dissolved in the water, and after being mixed the whole is well stirred up to make the mash as required. As the cutworms are night feeders, the bait should be applied in the late afternoon and evening. The use of insecticides for cutworms is a remedial measure only, and is not necessary, normally, if efficient cultural practices are applied on the farm.

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THE CULTIVATION OF GRAIN SORGHUMS.

During the past two years climatic conditions prevailing in Southern Queensland have not favoured maize production, particularly on the Darling Downs and on farm lands west of the Main Range. The production of grain sorghum as an alternative to maize in the drier farming areas, therefore, is well worth consideration when planning cropping programmes. There is no doubt that suitable varieties of grain sorghums will yield profitably under seasonal conditions which are usually unsuitable for maize grain production.

Friable medium to heavy loams will produce the heaviest yields, but satisfactory crops can be grown on average wheat lands throughout the Darling Downs, Maranoa, and the agricultural districts of Central Queensland. The best results are obtained from thoroughly cultivated winter fallowed land.

Grain sorghums may be sown through standard grain drills, either in rows 3 feet to 4 feet apart, permitting of inter-row cultivation, or through every grain run or every second grain run of wheat drills. When sown in the wide spaced rows, 4 to 5 lb. of seed per acre are usually necessary, although satisfactory stands have been obtained with a seeding rate as low as 3 lb. per acre.

Of the tall-growing varieties Feterita and Standard Milo have given the best results, Blackhull, Kafir, and White Milo also being satisfactory types.

For large-scale production of such varieties it is necessary as a rule to harvest with a maize binder prior to curing, carting, and threshing.

Small areas can be headed with a cane knife and carted direct to the barn, subsequently passing the heads through a thresher or corn sheller suitably adjusted for the purpose.

The dwarf-growing varieties, however, offer the greatest opportunity for economical production within the wheat areas, as harvesting can be undertaken successfully with header-harvesters, reaper-threshers or auto-headers.

During the 1936-37 season, when maize crops on the Downs failed generally, small areas of Wheatland, Milo, Brown Yolo, Kalo, Day Milo, and Dwarf Pink produced marketable grain, the yields varying from approximately 6 to 50 bushels per acre, according to seasonal conditions in the district concerned, three growers harvesting with standard grain harvesting machinery. As grain sorghums can be relied on to produce heavier yields than maize during any season, the fact that machine harvesting is now possible should greatly enhance their popularity.

In some districts bird pests are very troublesome; but with increased areas these probably would prove less serious.

Regarding food value, the grain sorghums are little inferior to maize. Feeding tests carried out in the United States of America have indicated that grain sorghums had approximately 90 to 95 per cent. of the feeding value of maize for fattening cattle, pigs, and lambs. The protein content of grain sorghums is higher generally than that of maize.

Seed supplies of the dwarf-growing varieties are very limited, the stocks previously held by the Department of Agriculture now being exhausted.

However, it may still be possible to secure seed from growers on the Darling Downs and in the Rockhampton district. Inquiries should therefore be directed to the offices of the Department of Agriculture and Stock at either Toowoomba or Rockhampton.

The Sweet Potato.

N. E. GOODCHILD, Senior Instructor in Agriculture.

THE sweet potato is not cultivated in Queensland to-day to the extent that its usefulness warrants. At one time it was used largely on the householder's table, but now it is a rarity.

When questioned about the shortage of sweet potatoes for table use, the farmer usually replies, "There is no demand for them." This is true only in part, as there is still a demand for the right varieties. A dry floury, or a moderately moist, potato will suit the consumer best. No doubt, some of the good varieties in use in the past are not now available, because of droughts and irregular planting, but many are still grown in certain localities. If the planting is confined to varieties which have proved popular with the consumer, and which could be sold on name, the demand for them should be continuous. Under present conditions a householder may buy sweet potatoes which are unpalatable. If, however, consumers realised that there were different types and varieties of sweet potatoes, they would learn to purchase only those varieties suitable for culinary purposes.

Market gardeners should, therefore, cultivate varieties for which they could readily find buyers, as some are already doing with good results. Very watery or stringy varieties are both undesirable. It is a mistake for a grower to allow a portion of his crop to stand over after maturing, as the tubers then begin to deteriorate in quality.

The sweet potato is a hardy, vigorous grower, but prefers deep sandy loam soils, as the texture of the soil affects the form, size, and smoothness of the potato. The period of planting is dependent very largely on the locality; in most parts along the coast it may extend from October until the end of February, the tubers being ready to lift within three to four months after planting. The crop must mature before the frost commences. It does not require a heavy rainfall—in fact, excessive moisture is detrimental, in that it increases the growth of vines, and lessens the development of tubers.

The most satisfactory method is to plant a few medium-sized tubers in a nursery-bed of good friable soil, which is mulched in order to retain moisture and promote rapid growth, and to pick slips or cuttings as growth progresses. A bed of fifty selected tubers planted in this way will provide many thousands of cuttings. The alternative, and less satisfactory, method of obtaining planting material is to procure cuttings from an old plot, which is usually neglected. The terminal cutting from the vine is generally regarded as giving the best results. The land is set up in ridges 3 feet apart. The cuttings should be 12 to 15 inches in length, and planted on the ridge to a depth of approximately 6 inches, cuttings to be set from 20 to 24 inches apart. On well-prepared soil weeds should not be troublesome, shallow cultivation being sufficient until the runners commence to cover the ground.

A classification of all varieties grown in Australia was carried out in recent years by an officer of the Department of Agriculture and Stock, and cuttings of a known type, together with a number of new seedling varieties, were distributed in different agricultural districts of the State. Some recommended varieties for planting for table use are Gold Coin, Seedling No. 3, Brook's Gem, and Snow Queen—which are obtainable in the Rockhampton district—and Porto Rica, Market, Red, Director, and Farmers' Special, which are obtainable more readily in the southern districts.

It is advantageous to the grower to market the tubers in a clean and attractive condition.

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GRADING OF ONIONS.

Onion harvesting generally will commence in October. Flavour, size, firmness of texture, and capacity to carry well without serious bruising or other damage all influence their market value.

Buyers, however, sometimes complain of onions being marketed without due regard to their classification in accordance with the size of the bulbs. It is the custom of some growers to include large and small sized onions in the same bag. This practice is against the interests of the farmer, contrary to the wishes of the selling agents, and results in comparatively lower realisations on the market.

Onions should be classified according to their size. The small sized onions, say, below 2 inches in diameter, should represent one "size" grade. Onions ranging from 2 inches to less than 3 inches in diameter should comprise another grade, and onions from 3 inches to 4 inches in diameter should form a further grade.

Some growers prefer to classify the onions in grades in accordance with each ½-inch increase in diameter. This practice results in the onions in each grade being very even and uniform in appearance.

The number of grade classifications should be determined by the variation that occurs in the size of the individual bulbs comprising the crop. In ordinary circumstances, the classification of the bulbs into three or four grades will suffice. It is important, however, that the onions should be graded as evenly as practicable. All "outsized" bulbs, especially the onions that are coarse, and are customarily referred to as "bull-necks," should be rejected.

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WHAT IS SUCCESS IN FARMING?

The successful farmer is often spoken of, and so the question arises naturally: What is success in farming? Most people without practical experience will say that is very easy to answer. From experience it is known that the longer the calling of farming and stockbreeding is practised the more it is realised that success in agriculture and other land industries is not so simple as it looks.

To one man, success will mean the winning of a prize at the Brisbane or district show; to another it means having the best kept farm for miles around; to yet another success will be assured when the mortgage is lifted. Many may dream of the day when they can lie in bed with tea and toast in hand listening to the cows being yarded; or spread out in a squatter's chair on the veranda watching ripe apples falling into the basket.

However, when the business of farming is looked at in its true perspective it becomes plain that some men on the land have no definite aim. Farming is such a long-term job that, to get any real measure of satisfaction it is necessary—and would pay handsomely—to decide on a general policy and stick to it.

Difficulties are often due to lack of a definite policy—planning of the work and working to the plan—and the great attraction in agriculture is that it gives so much room for initiative and success. If initiative is lost much of the joy will soon go out of work on the land.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled during the month of August, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb	Lb	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	Mature Cow, (Standard 350 Lb.).			
Model 3rd of Alfa Vale (365 days)	W. H. Thompson, Nanango	18,733·9	835·071	Reward of Fairfield
	Senior, 2 Years, (Standard 250 Lb.)			
Sunnyview Gaiety	J. Phillips, Sunnyview, Wondai	13,938·6	454·262	Burradale Byron
	Junior, 2 Years, (Standard 230 Lb.).			
Rosenthal Roseleaf 17th (246 days)	M. C. and A. M. Sullivan, Pittsworth	6,502·52	268·048	Rosenthal Carbine
Sunnyview Princess 3rd	Burnett Brothers, Brookfield	7,283·2	267·64	Burradale Byron
College Molly 5th	Queensland Agricultural High School and College, Gatton	6,143·76	231·237	College Butterman
	JERSEY.			
	Junior, 2 Years, (Standard 230 Lb.).			
Bluebell of Peeramon	O. H. O. Koppen, Peeramon	4,924·6	293·3	Trinity Sagunda's Prince
Bellgarth Birthday III.	D. R. Hutton, Cunningham	5,339·97	277·413	Airlie Thorn
Limelight of Peeramon	O. H. O. Koppen, Peeramon	4,742·85	231·644	Trinity Sagunda's Prince
	FRIESIAN.			
	Junior, 2 Years, (Standard 230 Lb.)			
Arcadia's Queen Zara	F. C. Noller, Kumbia	6,375·7	252·739	Ryfield Sultan 2nd

The Tropics and Man

Effects on the Nervous System.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

Second Series: No. 3.

IN the last two articles the words "nervous system" have cropped up several times. By devious channels this section of the body's machinery seems to come in for special attack by the various factors of tropical climate. So true is this, and so important the results, that it seems advisable to consider it a little more fully here.

Development of the Brain.

The lowest animals have no nervous system. The different parts are so close together and the animal's structure is so simple that a nervous system is of no more use to it than telephones would be in a small store. Animals slightly higher in complexity have a nerve net, just as an office may have a simple telephone system without a switchboard. In a large factory, such a simple net would be cumbersome and inefficient, so a central switchboard is installed. Just so do the next higher animals develop the most forward part of their nervous system as a brain. This brain becomes more and more highly developed as the animal's complexity increases until the incredibly complicated nervous system of man is obtained to the despair alike of the medical student and the sufferer from neurasthenia.

The nervous system is at once the most delicate, the most complex, and the most essential system that man possesses. For these reasons it bears the brunt of every-day stresses, and if disturbed, involves the body in the most important consequences (e.g. a motor car smash after three whiskies). Scientists investigating the electrical changes in nerve cells had to invent apparatus so delicate that it was disturbed by the compression of the air in the room when a gust of wind blew against the wall of the closed building. That may give you some idea of the incredibly delicate nature of the nerve cell. Yet the smallest variation in these processes means a huge alteration in the efficiency of the nerve cell. If we once realise that, the wonder is, not that our surroundings affect the nervous functions, but that we can live at all. The most delicate instrument made is the crudest toy as compared to the nerve cell.

Control of Body Temperature.

We saw in an earlier article that the main purpose of the body's behaviour when placed in hot surroundings is to keep the body's temperature constant, or at least within a certain harmless range. This may at times be possible without interfering unduly with body function; at others, some sacrifices may have to be made; at others, it may be quite impossible, no matter what sacrifices are made by the different systems. In all these adjustments, the nervous sytem, as befits its nature, has many duties to perform. Through its activities the sweat glands are called into action, the skin blood vessels dilated, extra fluid thrown into the circulation, and muscular relaxation increased—all measures designed to increase loss of heat from the body or diminish its production within the body. The decreased desire for physical work is also protective, and, in a way, a function of the nervous tissue. Certain of the ductless glands, particularly the suprarenal medulla, are under nervous control and have to be regulated to the same general ends—maintenance of a constant body temperature.

Thus the nervous system is not merely a passive victim of hot surroundings, but is actively engaged in combatting their effects. Upon its efforts depends, to a large extent, not only the fate of other bodily tissues, but also its own.

Can Stand Honest Work.

The nervous system has a great deal of work to do in combating heat, but this alone would not worry it unduly. After all, work is its job, and it is built to stand up to a good deal of work. Like the modern motor car, it can stand a lot of honest work; it is abuse which wears it out. Abuse of the nervous system occurs very easily in hot climates. Such abuse may be internal and natural or external and unnatural.

Internal or natural abuse of the nervous system arises largely from circulatory failure as I have mentioned before. Because of the dilation of the skin blood vessels, reduction of muscle tone, and loss of water, the available blood has difficulty in filling the vessels completely. Even a small reduction in the amount of blood available to the brain may have profound effects, so incredibly delicate is its mechanism. Insufficient oxygen may be supplied or insufficient wastes removed.

Even if there is a sufficient volume of blood, it may easily be too concentrated, or have a wrong balance between its acid and alkaline components, or have too little salt, or be at too high a temperature. Any one of these things may throw the working of the nervous system quite out of gear. Mild disturbances might result in tiredness or apathy, moderate upsets in irritability, sleeplessness or neurasthenia, severe disturbances in a complete failure of adjustment to heat with fainting, rapid rise of temperature or death. Milder symptoms are the most common, but by no means negligible. They undoubtedly turn a good many worthy people away from the tropics and furnish a serious and continual drain upon the efficiency of hosts of others, particularly in the field of mental endeavour.

External or unnatural abuses arise from our own ignorance or folly. Unwise eating, both in quantity and quality, neglect of commonsense precautions amounting sometimes to gross carelessness, abuse of alcohol and other stimulants, and failure to face up to facts are appallingly prevalent. I have at times been guilty of most of these, without being in any way conspicuous in my behaviour.

Forewarned is Forearmed.

Internal abuses can be minimised by methods I have already suggested—taking plenty of fluids, eating a balanced diet, adding sufficient salt to the food, keeping a proper balance between rest and exercise, taking all the usual measures to keep physically fit.

External abuses have such obvious remedies that they are very commonly forgotten. It is a true case of familiarity breeding contempt.

Over-eating is general; and eating too much of one type of food at the expense of others is very prevalent. The diet should be as varied as possible, even at the one meal. It is well to choose as much as you can from the "foundation foods"—milk, meat, cheese, eggs, fruit and vegetables, and use other foods only to fill in the gap. In many country places the gaps are as yet many, although improvement is on the way. Much more use can be made of shade in our country towns, and kitchens can be made much less like a vision of the under-world. Larger kitchens placed on the shady side of the house, with insulated or even electric stoves, and adequate coolers, ice chests, or refrigerators are essentials to home-building. Free ventilation in humid climates, thick insulated walls and closed rooms during the heat of the day in dry climates are essential. Air-conditioning is still a dream, but must soon become reality in tropical housing. Something might be done in the matter of adjusting working hours to tropical conditions. As an alternative to the siesta-arrangement, there is the practice adopted widely in Malaya of commencing work about six in the morning and finishing about four in the afternoon, which leaves a considerable and attractive part of the day for social and sporting activities. Alcohol in reason at the end of the day's work is a matter for individual judgment; alcohol during the day in all but the most moderate and dilute form (or in excess at any time) can be nothing but detrimental.

Mental activity requires as much drill as physical. The mental sluggishness characteristic of hot weather is remedied by acclimatization and this in turn is aided by physical fitness. The lapse into mental sloth is insidious but real, unless active steps are taken to forestall it. If efficiency is to be maintained, this must be done. Mental inactivity as much as over-worry is to be avoided.

SHEEP LAND FOR GRAZING SELECTION.

BARCALDINE AND HOME CREEK RESUMPTIONS.

Portions 7 and 9, parish of Home Creek, comprising part of Barcaldine and Home Creek resumptions, will be open for Grazing Homestead Selection at the Land Office, Barcaldine, on Thursday, 11th November, 1937, at 11 a.m.

The portions are situated about 24 and 28 miles south of Barcaldine.

The areas of the portions are 26,615 acres and 20,930 acres.

The term of each selection will be twenty-eight years, and the annual rental for the first seven years is 4¼d. and 4d. per acre, respectively.

Each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years.

Both portions are artificially watered, but more water will be required on portion 9. They comprise downs country and are first-class sheep areas, suitable for fattening, woolgrowing, and breeding.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Barcaldine, and the Queensland Government Tourist Bureaux at Sydney and Melbourne.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Kangaroo Apple.

K.J.D. (Fernvale)—

The specimen forward with your letter represents the kangaroo apple, *Solanum aviculare*, a native plant that frequently comes up very abundantly following a scrub burn. The plant is not known to possess any medicinal value. The late Dr. T. L. Bancroft found it to contain an alkaloid similar to nicotine. The berries have been sent to us on one or two occasions as a reputed poison to pigs; on another occasion we received specimens of the young growth said to have been responsible for the deaths of a number of sheep in the Tara district. Pulling up by the roots is the only method of eradication. It would probably succumb readily to a weak arsenical spray, but there is always the possibility of stock becoming poisoned by eating the sprayed foliage. We think it likely that after a time the plant will choke itself out. It seems to be essentially a weed of freshly cleared country.

Kangaroo Grass.

B.S. (Bunya, via Aspley)—

The botanical name for kangaroo grass is *Themeda australis*. The heaviest seed crop is borne in the months of February and March, but it varies somewhat with the seasons. Buffalo grass is *Stenotephrum secundatum*. This grass flowers at different times of the year, mostly in the late summer months. It does not produce fertile seeds, at least not under Queensland conditions, and propagation is always by division.

Berries and Burrs.

A.H. (Laidley)—

1. *Melia dubia*, white cedar. The berries of white cedar are poisonous to stock, particularly pigs.
2. *Acanthospernum hispidum*, star burr. A very bad weed in parts of Queensland, particularly in the North. It is not known to be poisonous or harmful.
3. *Cassia Sophera*, sometimes known as arsenic bush or yellow pea. If eaten in any quantity by stock, it probably would cause severe purging, as it belongs to the genus which produces the senna leaves of commerce.
5. *Malvastrum spicatum*. A very common weed of the Mallow family, often called *sida retusa*, but the true *sida retusa* is a different plant. It is not known to possess any poisonous or harmful properties.
6. *Alstonia constricta*, native cinchona or quinine bark. Feeding tests in New South Wales show this plant to produce nervous symptoms somewhat similar to those of strychnine poisoning. It is not likely, however, that an odd mouthful taken by dairy stock or travelling cattle would cause serious trouble.

The rumen contents were examined, but contained only grass and two or three odd leaves of eucalypts, probably picked up in the grass at the time of feeding. No leaves, berries, or seeds of any of the above six plants were found in the rumen contents.

An Edible Berry.

M.H. (Charvel, Theodore)—

The specimen is *Myoporum debile*, a creeping plant producing an edible berry. It is fairly widely distributed in the State, but we have not heard a common name given to it. The generic name, *Myoporum debile*, is quite short enough for general usage. Most of the species of *Myoporum* are shrubs or trees, and the present plant is an exception to the rule, hence the specific name "debile," meaning "weak" or "lowly."

Native Bryony.

S.D. (Coomera)—

Your specimen represents the Native Bryony, *Bryonia laciniosa*, a fairly common vine in parts of Queensland, particularly among the secondary growth in freshly cleared scrub country. It is poisonous, but so far as we have observed, is rarely touched by stock.

Wild Onion.

M.H. (Tannymorel, via Warwick)—

The plant sent is a wild onion or onion weed, *Asphodelus fistulosus*. It is a native of the Mediterranean region. It has appeared in some places on the Darling Downs. In some parts of New South Wales it tends to take possession of the land wherever it gains root. It is not eaten very readily by stock, but if cows happen to eat it an offensive smell is given to the milk.

If you have only a few plants on your property, it would be advisable to eradicate them.

Balloon Cotton.

H.C. (Milmerran)—

The specimen sent is the Cape Cotton or Balloon Cotton, *gymphocarpus fruticosus*, a native of South Africa, now a widespread weed in Queensland. It is usually left untouched by stock, but if eaten in any quantity, is poisonous. The silky cotton surrounding the seeds has no commercial value.

Cudweeds, Turnip Weed, Fish Weed, and Nettles.

G.H. (Booinbah)—

1. This specimen bore neither flower nor seed, but looks like *Gnaphalium* sp., a cudweed. The cudweeds are very common plants, both as weeds of cultivation and of the pastures of Queensland. They are eaten sometimes by stock, but their wiry hairs are said to cause impaction.
2. *Sisymbrium orientale*, tumbling mustard. This and several other plants of the family *Cruciferæ* are known frequently as turnip weeds or mustard weeds. They all give a strong flavour to milk or cream.
3. Specimen too young to determine.
4. *Lamium amplexicaule*, henbit or dead nettle. This is a very common weed during the winter and spring months in many parts of Queensland. It is allied very closely to the stagger weed or wild mint, and, like it, causes shivers or staggers in working horses and travelling stock. Ordinary paddock resting stock, however, eat the plant with impunity. In fact, most dairymen look on it as quite a good fodder.
5. *Rhagodia hastata*. The name fishweed is given to these plants on account of the peculiar flavour they give to milk and cream.

"Mexican Clover"—A Serious Pest.

A.D.C. (Glasshouse Mountains)—

The specimen is *Richardsonia braziliensis*, sometimes called Mexican clover, although this name is rather misleading, as the plant does not belong to the clover family.

It was boomed some years ago as a fodder, but our experience has been, on the whole, that stock do not eat it readily. If you have only a small patch, we would advise you to get rid of it, because once it sets seeds it is a very serious pest, particularly in pineapple plantations.

Purgative Properties.

D.E.E. ("Croxdale," Charleville)—

The specimen is the Bean Bush or *cassia pleurocarpa*. This plant, which is widely spread in Australia, has been very much on the increase in the Charleville district of recent years. It has not been proved definitely poisonous. On the whole, the species of *cassia* contain purgative properties, the senna leaves of commerce being the product of several species.

Mist Weed.

A.H.S. (Yeerongpilly)—

The specimens have been identified as mist weed, *Eupatorium riparium.* This plant has a fairly strong hold in South Coast districts, especially along creeks. In some localities it is thought to be poisonous to stock, but, so far, there is no definite evidence of a poisonous character.

Castor Oil Plant.

A.S. (Roma)—

The specimen you send is the common castor oil plant. The seeds of this plant contain the commonly known castor oil. As the fruit contains a poisonous substance, it should be treated as poisonous. It is presumed generally by botanists that the plant was a native of Africa, but it now is cultivated in many tropical and sub-tropical countries. Its botanical name is *ricinus communis*, and it belongs to the euphorbian family.

Cassia Lignum-Vitae.

C.H. Malmoe Siding, Mundubbera line)—

1. *Cassia eremophila*—the shrub with yellow flowers. Plants of the Cassia genus are mostly regarded as possessing purgative properties. As a rule, stock do not eat them readily.
2. *Vitex Lignum-vitae*, native lignum vitae. This is not known to be poisonous. It is mostly avoided by stock.

Native Elderberry.

R.C. (Brisbane)—

The specimen forwarded with your letter is the native elderberry, *Sambucus gaudichaudii*, a shrubby plant very common in parts of the Lockyer Valley. We have not heard, however, of its being a bad pest to cultivation. The best means of poisoning it would be to cut it somewhere about ground level and to pour arsenic into the freshly-cut surface as soon as possible. This should run down to the lower parts of the roots and eventually kill them out. So far as we know it is not a pest in any other part of the State.

Spear and Wire Grasses.

M.T.R. (Wallace, via Burketown)—

1. *Heteropogon contartus*, bunch spear grass. The name bunch spear grass refers to the habit of the long awns or spears to become entangled among themselves in bunches. This grass is quite palatable in the young stage. As a matter of fact, we have known it used as a chaff or chop chop for horses in a drought period even when fairly old. In this state, however, its nutritive value is very low. It is one of the commonest grasses in the coastal and near coastal belt of much of North Queensland.
2. *Aristida* sp., a wire grass or three-pronged spear grass. The wire grasses, of which there are a number, are very closely allied species. Some are not regarded as having very much value as fodder. The grass you describe as kerosene grass is evidently a species of *spinifex* or *triodia*, of which we have several in North Queensland and the Northern Territory. So far, we have not succeeded in finding a grass that can grow in competition with it and smother it out.

Burr Trefoil.

W.B. (Rocky Creek, Yarraman)—

The specimen is *Medicago denticulata*, the burr trefoil. This plant is very common during the winter and spring months in Queensland, particularly following winter or spring rains. It is quite a good fodder, but, in its green state, is apt to bloat stock if they feed heavily on it. When it dies down it presents a mass of burr-like pods. These are eaten readily by stock, particularly sheep. The plant is particularly common in some of the Downs country, and causes a good deal of trouble in belly-wool. The seed is stocked by most reputable seedsmen, and should be sown preferably in the autumn months.

General Notes

Staff Changes and Appointments.

Mr. H. G. Knust, Instructor in Cane Culture, Innisfail, and Mr. S. A. Clayton, Inspector of Dairies, Caboolture, have been appointed also Inspectors under the Diseases in Plants Acts.

Constable J. H. Lewis, Emerald, has been appointed also an Inspector under the Brands Acts.

Messrs. A. R. Brooks and E. A. Harden, of Zillmere Road, Zillmere, have been appointed Honorary Rangers under the Animals and Birds Acts.

Messrs. M. Buchanan (Gympie) and E. N. Greaves (Coolangatta) have been appointed Growers' Representatives on the Banana Industry Protection Board until 30th September, 1938.

Messrs. D. F. Vaughan (District Scout Commissioner, Rockhampton), L. V. Masters (Organising Commissioner, Boy Scouts' Association, Brisbane), W. R. Thomson (Scoutmaster, Rockhampton), S. W. Holmes (Cubmaster, Taringa), and A. J. O'Farrell (Scoutmaster, Koumala) have been appointed honorary rangers under the Animals and Birds Acts.

Mr. C. J. McKeon, Director of Tropical Agriculture, has been appointed Director of Agriculture, Department of Agriculture and Stock.

Mr. W. Leslie, Assistant Instructor in Fruit Culture, has been transferred from Toowoomba to Bowen.

The resignation of Mr. B. Courtice, Bundaberg, as a representative of sugar-cane growers on the Sugar Experiment Stations Advisory Board, has been accepted.

The following have been appointed honorary rangers under "*The Animals and Birds Acts*, 1921 *to* 1924":—

> Messrs. S. W. Gibson, H. V. Hanson, W. F. Klaka, J. Roberts, G. Mann, E. W. Ford, F. Ferguson, E. G. Fowler, J. Harris, A. P. Couper, T. R. Lucas, H. J. M. Ransden, D. Watt, senr., H. Watson, and C. J. Mann, of the Inkerman Mill Suppliers' Committee, Home Hill; and
>
> Messrs. W. M. E. P. Prufert and T. Knopke (Summerhill), S. W. Hutchens, junr. (Crediton, Dalrymple Heights), J. V. Sullivan (Dalrymple Heights), and R. J. C. Wood (Eungella, Dalrymple Heights).

Cotton Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts providing that the growers' representatives on the Cotton Board shall be elected triennially instead of biennially as at present. The members of the board shall hold office for a period of three years, and this provision shall apply to the 1937 election of members, as well as to all future elections.

Grade Standards for Cavendish Bananas.

Schedule 6 of the Fruit and Vegetable Grading and Packing Regulations has been rescinded and a new schedule, embodying grade standards for Cavendish bananas, issued in lieu. The amended grades provide for cased bananas packed in both clusters and singly. Cased bananas packed in clusters shall be divided into three grades—"Small," "Standard," and "Large"—and at least 90 per cent. of the bananas in any case so packed shall consist of clusters of not less than three bananas each. Cased bananas packed in singles shall be divided into five grades—"Small," "Sixes," "Sevens," "Eights," and "Nines."

Broom Millet Board.

Orders in Council have been issued under the Primary Producers' Organisation and Marketing Acts providing that elections of growers' representatives on the Broom Millet Board shall be held triennially and that members elected shall hold office for three years; further, giving notice of intention to extend the operations of the Board for the period from 1st November, 1937, to 31st October, 1943. Growers of broom millet who have supplied their product to the Board may forward a petition for a poll on the question of whether or not the Board shall be extended as above.

"Pig Breeders' Annual"—World Pig Progress.

Published by the National Pig Breeders' Association of Great Britain as one of a series, the 1937-38 edition of the "Pig Breeders' Annual" just to hand from London is a worthy successor to a long line of useful, informative publications, which have gained for the "Annual" a world-wide circulation, and this latest edition has been the means of distributing an immense amount of helpful information to pig raisers in all parts of the world.

The "Pig Breeders' Annual" is the only publication of its kind in the world. Its contributors are men well and favourably known in the sphere in which they work, and as units in a world-wide organisation; and its appeal is one that should find for it a place in the library of every pig producer whose heart is in his business.

Among the many very informative contributions to the book is that which deals with the world's pig progress, a survey of production in all the principal pig-raising countries, with informative statistics, and a general review of the lines along which different peoples work in this particular industry.

The Australian contributors include Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising in the Queensland Department of Agriculture and Stock, who deals in an interesting way with the influence of N.P.B.A. breeds on Australia's pig-breeding industry, and Mr. Richard G. Watson, of Brisbane, who gives his "Impressions of European Pig Production," gathered during a recent visit to Great Britain and Denmark.

Mr. Watson, in addition to being a successful commercial and stud pig farmer, is also vice-president of the Queensland branch of the Australian Stud Pig Breeders' Society and chairman of the Australian Pig Industry Council, as well as being the pig producers' representative for Australia on the Australian Meat Board.

In addition to many other helpful contributions, the outcome of experiments, research, and surveys, the "Annual" carries a large number of useful tables, statistical data, clear sharp illustrations, and many very fine advertisements.

The fact that 500 copies of this publication already find a place in the homes of Australian pig producers should be a guarantee of good faith and an assurance that at 3s. 6d. post free it represents excellent value. Copies may be obtained direct on receipt of remittance addressed to Mr. E. J. Shelton, Department of Agriculture and Stock, Brisbane, Queensland.

Control of Plague Grasshoppers.

A Proclamation and Regulation have been issued under the Diseases in Plants Acts declaring that the area comprising the pastoral districts of Moreton and Darling Downs shall be a quarantine area in respect of the plague grasshopper, and prescribing the nature of the quarantine to be imposed.

Provision is made for the laying of baits prepared from arsenic pentoxide, molasses, water, and bran on roads, stock routes, and reserves where the grasshoppers are prevalent. Property owners and local authorities shall lay such baits on their holdings and all areas under their supervision.

The following officers of the Department of Agriculture and Stock have been invested with the powers of Inspectors under the Diseases in Plants Acts, and will be available to render any assistance in connection with the control of the pest:—

Messrs. P. Round (Pittsworth), R. E. Watson (Oakey), E. T. Lewin (Dalby), D. Culhane (Toogoolawah), and A. Hossack (Laidley).

Queensland Cane Growers' Council.

The result of the voting in connection with the levy of ½d. per ton of sugar cane harvested during the present season—to be utilised by the Queensland Cane Growers' Council by expending the same on matters of an economic, legal, or compensatory nature where such matters are of vital importance to the sugar industry—was:—

For the levy	911 votes.
Against the levy	2079 ,,

Fruit Fly in the Stanthorpe-Warwick-Killarney District.

A Proclamation and Regulation have been issued under the Diseases in Plants Acts declaring the Stanthorpe, Warwick, and Killarney districts to be a quarantine area in respect of fruit fly, and prescribing the nature of the quarantine to be imposed in such area. Orchardists shall control fruit fly by placing, at certain specified periods, traps charged with fruit fly lure approved by an inspector at the rate of ten per acre amongst all trees in their orchards.

Rural Topics

Lamb-marking.

The term "lamb-marking" covers the castration and tailing of the male lambs, tailing the ewe lambs, and the snipping of the registered ear mark. The best age at which to mark is from a fortnight to one month old.

The operation should be performed under the most hygienic conditions possible. The use of old yards should be avoided so as to minimise the risk of tetanus and septicæmia. All instruments should be absolutely clean at the commencement of operations and must be dipped into a disinfectant frequently during the progress of the work.

There are two methods of castration, namely, tipping and slitting. The latter practice has the advantage of giving a wether a better cod when fat.

Tipping, however, is advocated, for the wounds heal more quickly in lambs treated in this way. Where the flock is small, farmers are advised to hurdle off a temporary yard in the corner of a paddock. The lambs, when marked, should be dropped on to clean pasture land. A non-arsenical dressing, which is both curative and blowfly repellant, should be applied to all wounds with a clean swab or brush, and a careful watch kept over all treated lambs. Should the flies be bad fresh treatment may be necessary.

—*J. L. Hodge.*

Milk from Newly-calved Cows.

With the approach of spring, dairy farmers should be careful regarding their increased milk supplies, especially colostrum milk. The milk of the newly-calved cow is abnormal, and is called colostrum or beastings. It is yellow in colour, has a rather strong pungent taste, an unpleasant odour, a sickly albuminous flavour, a high specific gravity, a high total of solids, high albumen, and low figures for fat and sugar. The fat of colostrum has different properties from that of normal milk, and the sugar is largely glucose and not lactose—it also shows a larger proportion of phosphate.

Such milk serves as food for the new-born calf, and increases the resistance of the calf to disease during the first few days of its existence. It is not to be used as a means for increasing the supply to the factory. The milk becomes more normal day by day until, in seven days after calving, it is practically normal, although it may take up to a fortnight to attain perfectly normal composition.

It is advisable to isolate the newly-calved cows, and for the first seven days at least this colostrum milk should not be mixed with normal milk, either for butter or cheese making. Cream from such milk blended with good cream results in the whole delivery being graded down either to second grade, or in being completely rejected. For that reason this milk should not be separated on any account. Colostrum milk is quite unfit for cheese-making, since it is easily coagulated by heat, curdles very slowly with acids and rennet, and results in very poor quality cheese.

It should be remembered, therefore, that—(1) Colostrum milk is food for young calves only; (2) it should on no account be sent to cheese factories or, as cream, to butter factories.

—*O. St. J. Kent.*

Tar Branding of Sheep.

Wool from sheep which have been tar-branded is sold often at a lower price than wool branded with one of the several branding fluids on the market. These branding fluids are very satisfactory, being harmless and having no ill-effects on the wool, while at the same time they are readily emulsifiable.

It is difficult to remove tar from the wool during the process of manufacture. Tar-stained wool, therefore, may bring a lower price than clean wool free from tar.

The grazier obviously in his own interests should discontinue the practice of tar-branding.

Jack Howe, Shearer—The Man and His Records.

Jack Howe, in his own day and in his own sphere, was just as well known as any champion cricketer or boxer, and, as is the case with all champions, there was no lack of rivals eager to displace him from his position of pre-eminence. Shearers would make big journeys to try their skill against him, but nearly all of such contests enhanced rather than diminished Howe's reputation.

On one occasion Howe was shearing at Evora Station. Amongst the other men was a very fast shearer, Harlin by name, who came from New Zealand. Harlin had hopes of "ringing" the shed in spite of Howe, and there was keen interest amongst the rest of the men to see how the two champions would fare. Shearing started on a Monday. On that day the Queenslander shore 111 sheep and the New Zealander 92—not high tallies for first-class shearers, but the sheep carried a great deal of sand in their fleeces. On the Tuesday Howe's tally was the same, with Harlin's a little closer to it; it was successively closer still on Wednesday, Thursday, and Friday, and it appeared that Howe at last was to meet his match. There was a belief held by some of the men that the champion was apt to "go to pieces" when pressed, and, acting on this belief, Harlin's backers urged their man to make a special effort on the Saturday, when only a half-day would be worked. The New Zealander responded to their urging with a very good tally of 84 for the half-day. But, to the surprise of everyone and to the discomfiture of Harlin, Howe's tally still remained at 111. The victory was such a decisive one that it ended any hopes of Harlin "ringing" the shed.

Howe established his famous record when shearing at Alice Downs in 1892. Between the starting and "knock-off" bells on October 10 of that year he shore no less than 321 sheep, and in so doing established a shearing record which has never been bettered. Keeping in mind that the shearing sheds of that period worked longer hours than they do to-day, Howe averaged more than a sheep every two minutes throughout the whole day. Even this fact, remarkable as it is, does not show what Howe was capable of when really extended, for, as a final spurt, during the last five minutes of his record-making day he shore five sheep, and had the sixth on the board as the bell rang, which, in accordance with shearing shed practice, was included in the day's tally.

Few records of any sort are established under anything but favourable circumstances, and Howe's feat was no exception to this rule. The sheep that were hurried up the race and bustled into the pens of Alice Downs shed on that memorable day were practically free of wrinkles, and carried open fleeces of a little less than the full 12 months' growth. Nevertheless, in every way it was a genuine record, and Howe received no assistance from anyone to which he was not fairly entitled, although it is safe to assume that his pen mate handled any rough sheep that were sent in to their catching pen. Favourable as the circumstances were to speedy shearing, the next fastest man on the board—a New South Wales champion—could not get to within a hundred of Howe's tally, so that his superiority was definitely emphasised in more ways than one. In this machine age, it is of interest to note that the record was made with blades.

Howe was not only a fast shearer—he was a good one as well. His work was marked by that effortless ease which is the mark of the master, and neither the man that owned the sheep, nor the boy that picked up the fleeces, nor the shed hands that rolled them, ever had reason to complain of his work. He died a few years ago in the centre of that district where he had created so many records, and his end was in keeping with a man who had always been a good sportsman and a true friend. He is one of the select few whose name is perpetuated by an article of clothing, for even to-day in the shearing sheds of Queensland the men speak of a sleeveless shirt as a "Jacky Howe"—the older ones with a reminiscent gleam occasionally lighting their eyes as the name recalls to their mind the big shearer who had set such a rattling pace forty years before.—B.W.P. in the "Sydney Morning Herald."

A Show Impression.

One of the advantages of owning livestock is the thrill to be got out of a good stock show. Shows are an excellent training ground for young farmers of ambition and arouses in them a sense of responsibility, and, above all, they learn how to take defeats as well as successes. Everyone likes the man who when he misses the blue ribbon says that his exhibit was beaten by a better beast. Behind every exhibit at the show there is keenness, intelligence of a high order, considerable capital, and a real love of the land and its industries.

New Legislation for Poultry Industry.

To give further protection to poultry farmers, amending legislation has been passed by the State Parliament. A method of determining the sex of "day-old" chickens—a method that requires the highest proficiency—is a recent discovery. The object of the new legislation is to make sure that only properly-qualified and expert persons may be licensed for the work of sex determination in chickens. When chickens are classified as cockerels it is usual for poultry farmers to sell them for rearing as table birds. The new measure will prevent unscrupulous dealers from selling the male chickens as a mixed flock or—as has happened—as pullets. Persons licensed to sex "day-old" chickens will be required to mark with a stain all chickens that they decide are males.

The Act provides also for the voluntary registration of hatcheries, with the object of raising standards in the chicken-dealing business.

Under the original legislation all poultry diseases had to be notified, but the amending measure makes it no longer necessary, except in cases of highly contagious diseases.

The selling of or attempting to sell diseased poultry for table use—poultry unfit for human consumption—is an offence, and inspectors will have much wider powers of condemnation.

The amending legislation will be welcomed by poultry farmers as a measure designed to further protect their interests, when either buying or selling.

Dehorning Calves.

Every dairy farmer knows the advantages of dehorning his poddies. There are sound reasons for dehorning cattle while they are still young. The operation is less painful than it is with grown cattle. It is cheap, quick, simple, and effective if reasonable care is taken. A herd of dehorned cows are quieter to handle and more content when yarded. They are not so liable to injury. They will give better and more consistent production.

Until the calf is about a week old the horn buttons are either not attached or loosely so, to the bones of the skull. It goes without saying that it is in this period that dehorning with caustic potash will give 99 per cent. results.

The best way to do it is to tether the calf short, but with rope enough to allow it to pull back. It can be straddled easily then. With sharp scissors clip the hair from each horn button. Roll a stick of caustic potash in a piece of paper, with one end protruding. In this way it may be handled without injury to the fingers. Dip the end of the caustic in water, and shake off surplus water, for if it drips the water may run into the eyes of the calf and blind it.

Each horn button should then be rubbed thoroughly with the point of the caustic until the skin is well broken. In a few hours the caustic will have done the job quite well.

No further treatment is required, but the calf should be kept covered for twenty-four hours. Bull calves usually require more treatment than heifers.

Caustic potash will last for years in an air-tight tin or jar, but—*and this is important*—do not keep it where children can get it.

Trucking Fat Lambs.

Complaints of the bruising of lambs consigned to market are not uncommon, but to a great extent the remedy lies in the hands of growers.

The tenderness of sucker lambs is often not appreciated sufficiently, and in many cases they are handled like fat sheep. Sheep, too, may be bruised by bad handling, though not so badly as sucker lambs. It should be remembered that true sucker lambs have never been off the mothers. It is advised, therefore, that if a road journey has to be undertaken some of the ewes should accompany the lambs to the trucking yards. A lamb should never be lifted by the skin. Prodding sticks should never be used. Over-crowding in the trucks should be avoided entirely. In all cases, every endeavour should be made to deliver the lambs at the market with the bloom on them. A certain loss in weight and appearance is unavoidable on a long journey, but if the foregoing rules were observed strictly, complaints of bruising would be

Orchard Notes

NOVEMBER.

THE COASTAL DISTRICTS.

Citrus Fruits.

In the citrus orchard the increase in temperature and the possibility of a dry period call for the utmost attention to soil conditions, particularly aeration and moisture conservation. At the slightest sign of distress, owing to lack of moisture, trees should be irrigated thoroughly whenever water is available for this purpose.

At the same time care and attention should be given to cultivation, particularly on hillside orchards, and in the coastal districts the possibility of the approach of storms will prompt growers to consider the completing of each cultivation by forming shallow drains to care for excess water and prevent soil losses.

Attention must be given to the incidence of mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." Usually the first indication of the trouble is when, with the sun shining on it, the fruit has the appearance of being covered with a grey dust. If examined with a good lens, the skin will be seen to be covered with numerous yellow slug-like insects which are living on the skin.

Under certain weather conditions scale movement may be expected.

Detailed information regarding insect control may be obtained from Department publications on the subject.

Pineapples.

Continue planting pineapples as discussed in these notes last month, always remembering that the modern practice is smaller areas, close planting with more pineapples per acre, quicker, better and more healthy growth, and finally better fruit by liberal fertilising through the leaf bases with 10-6-10. Taken all together, these recommendations tend towards the elimination of wilt.

Bananas.

New Plantings.—November and December are very suitable planting months in most districts. Just as modern methods have effected great improvements in pineapple culture, so they might be applied in principle to banana growing. Smaller areas and large production per acre should cut overhead costs and lighten labour, lengthen the profitable life of the plantation, and reduce the time of waiting for the crop. To this end select planting material with care, plant in large holes, and break up the ground as soon as possible after planting. To prevent the loss of top soil by erosion and to provide the bananas with a cooler and moister environment, plant a cover crop as soon as weather permits, and initial weed growth has been suppressed. This will hold the loose surface soil during the summer rains.

Young Plantations.—The correct follower or followers for each plant should be selected, if not already done, and all additional suckers suppressed. Cultivate to conserve moisture and mulch with a cover crop. A complete fertilizer will improve the coming crop.

Old Plantations.—De-sucker to one follower to each plant. Apply a complete fertilizer, if not already done, and cultivate to conserve moisture.

General.—Bait for borers; be prepared for grasshopper and caterpiller plagues; watch for bunchy top.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

KEEP the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. A sharp lookout must be kept for brown rot in fruit, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be sprayed frequently with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

TOURIST TRAVEL.

Vivid impressions regarding the possibilities of tourist travel in Queensland are gained during visits to different parts of the State. The tourist industry, as it may be termed, has become, like talking pictures, a world-wide industry and is being highly organised and widely advertised by the countries which have attractions to offer. Competition is very keen. Tourists might be divided broadly into three groups—intrastate, interstate, and overseas; each group has its special desires and idiosyncrasies, and thus the calls upon a tourist agency are many and varied. If the attractions are not made sufficiently enticing the tourists, particularly those belonging to the interstate and overseas groups, will go elsewhere. The Railways Department has done very good work in extending the activities of the Queensland Tourist Bureau, but progress seems to have reached a stage at which the Department needs the co-operation of outside bodies. Besides the actual attractions, there are such factors as access roads (in addition to main roads) and general approaches, modern hotel or other accommodation, water supply, lighting, and sanitation—which have a marked influence on tourists. But these things are controlled by a variety of authorities; these authorities might embrace—Main Roads Commission, Forestry Department, Licensing Commission, Local Authorities, Electric Light Authorities. Even the advertising and displaying to better advantage for tourist purposes of many of the unique attractions may fall to non-governmental authorities, and some of these bodies may not be able to take appropriate or adequate action through lack of ways and means. It was therefore suggested to the Premier (as President of the Bureau of Industry) that the Bureau, whose function it is to do work of the kind, should be deputed in co-operation with the Railways Department, to inquire into the aspects outlined and to furnish a composite scheme for the further and wider orderly development of tourist travel in Queensland: the scope of the inquiry to include the exploration of all relevant possibilities; the making of contact with individuals, groups, and organisations interested in the subject; the devising of ways for the securing of co-ordination amongst authorities which control utilities essential to a successful scheme of tourist travel; and, generally, to formulate an attractive and progressive programme which may be put into operation, piece by piece, as opportunity offers. The suggestion found favour, and the Bureau and the Commissioner for Railways have the matter in hand.

—*From the Annual Report of Mr. J. D. Story, I.S.O., Public Service Commissioner.*

Farm Notes

NOVEMBER.

FIELD.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be impressed too strongly upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated on obtaining a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growth and very often entails subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kafir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are suited particularly to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

COOLING OF CREAM.

If properly used under conditions of scrupulous cleanliness, a cream cooler will give excellent results. Besides lowering the temperature of the cream and thus checking bacterial development, a cooler ærates the cream, releases gases and food flavours, and improves its consistency. Freshly separated cream, after it has been cooled sufficiently, should be mixed with the cream already held in the dairy. Fresh and over-ripe cream should not be mixed, as is often done when lots are held in separate vessels until delivery day. Cream should be stirred frequently while it is held on the farm. Proper stirring controls the ripening.

OUR BABIES.

> *Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.*

CHILD WELFARE.

MOST important are the early beginnings of all things. Especially is this true of health. On the health of the mother depends the health of the infant; on the health of the infant depends the health of the child; on the health of the child depends the health of the adult; on the health of the adult depends the health of the State; and these must not be left to chance.

Largely they have been left to chance. Of recent years something has been done to promote health, something apart from the attempt to cure disease by hospitals and other means. Let us clearly understand that disease is nothing in itself, but only the absence of health, and that it is by the cultivation of health that we can best diminish disease. If our people are to be healthy they must learn to think in terms of health, and not in terms of disease. They must pursue the living fact, and not waste their energies in struggling with shadows.

There are three things that are now of the greatest importance. Firstly, the care of the expectant mother. This care is the responsibility of her medical adviser. The Lady Bowen Hospital has an ante-natal clinic; so have other maternity hospitals; and there are ante-natal clinics in the Valley and Woolloongabba. We must so educate our mothers that the excellent work done by all these shall be multiplied tenfold. For want of knowledge mothers and infants die or are crippled in health. Most pathetic is the loss of life and the survival of weaklings owing to the want of this care, which is freely offered to all mothers who will seek it.

Secondly, we want to reach, as far as possible, every mother and infant in the State. In the last fifteen years our infant mortality has fallen considerably, and we hope that it may fall still lower.

Thirdy, the health of the young child is now a pressing problem. Ill-health and deaths from infection are far too common. We must spread knowledge of the ways to prevent the spread of infection and to increase the resistance to infection by a sound diet rich in vitamines. Something has been done in this direction, but much more remains to be done. By special means we can give immunity to diphtheria and typhoid fever, and can surely eradicate hookworm; but against other infections very little has been done.

Let us do these things that we can, and presently we shall be able to do things that are now impossible.

IN THE FARM KITCHEN.

Inexpensive Meat Dishes.

To make cheap cuts very palatable, steep in seasoned oil and vinegar, allowing 2 tablespoonfuls olive oil to 3 tablespoonfuls of vinegar. Add to this 1 tablespoonful each of onion and chopped parsley, and pepper to taste. Soak meat for 1 hour, at least, turning in liquid occasionally.

Boiled Breast of Mutton.

Take 2 carrots, 2 small turnips, breast of mutton, boiling water, salt to taste.

Wipe the meat. Place in a saucepan. Cover with boiling water. Add salt to taste. Cover and boil fast for ten minutes, then simmer gently for one and a-half hours. Add sliced scraped carrots and peel turnips, cut into suitable pieces, cover, and simmer for half an hour.

Oxford Hot Pot.

Take 1lb scraps lamb or mutton, 2 sheep's kidneys, 1½ lb. small potatoes, 2 onions, 3 gills water, salt, and pepper to taste.

Place the meat, onions, and halved and scored kidneys in a casserole. Add water, potatoes, and salt and pepper to taste. Cover and cook in a slow oven till the potatoes are tender, but not broken. Remove the lid from the casserols foi the last quarter of an hour to brown the hot-pot. Serve in the casserole.

Roast Breast of Mutton.

Take 3 lb. breast of mutton, 6 oz. breadcrumbs, 1 onion (minced), salt and pepper, ½ teaspoonful chopped thyme, 2 tablespoonfuls chopped parsley.

Remove the bones from the meat, also any brown skin on the outside. Stew the bones in one and a-half pints of water and use for gravy. Flatten the meat well with a rolling-pin. Scrape all trimmings of meat and fat from the bones and put through the mincer twice. Soak the breadcrumbs in water until soft. Squeeze till almost dry. Put bread, minced meat, parsley, thyme, onion, and seasoning into a basin, and mix well. Spread stuffing on to the boned meat on the side from which bones have been removed. Roll up loosely and tie. Roast in a quick oven, basting with the fat that drips from the joint. Do not add any dripping to the pan. Dish up the roast. Remove string. Pour off most of the dripping from the pan, leaving only about a tablespoonful. Add half an ounce of flour. Stir into the fat and fry slowly till brown. Add half a pint of stock from the bones. Boil for four or five minutes. Season to taste, and serve in a sauce-boat.

Scotch Meat Shape.

Take ½ lb. minced meat, 2 oz. minced suet, 3 oz. breadcrumbs, ¼ teaspoonful curry-powder, 1 beaten egg, pinch of herbs, stock, pinch of nutmeg. brown breadcrumbs to cover.

Mix all the dry ingredients together, and add the well-beaten egg and a little stock. Pour into a well-greased mould. Cover thickly with brown breadcrumbs. Cover with a buttered paper. Steam for one and a-half hours. Serve turned out with gravy or white sauce.

Stewed Lamb and Green Peas.

Take 1½ lb. middle neck of lamb, 1 onion, 1 oz. dripping, 1 oz. flour, 1 pint water or stock, 1 tin green peas, salt and pepper to taste.

Melt the fat in a saucepan. When smoking hot, add the peeled and chopped onion and fry till brown and crisp. Remove the onion. Add the meat divided into suitable pieces for serving. Brown on both sides. Remove to a dish and drain off any remaining fat in the pan. Mix the flour to a paste with a little of the water or stock. Turn into a saucepan. Stir in the remainder of the liquor. Keep stirring till boiling. Add the meat and onion and simmer gently for two and a-half hours. Add drained tinned peas and bring again to the boil. If you use fresh peas, add them about thirty minutes before the stew is ready.

Steak and Kidney Pie.

Take 1 lb. shoulder steak, 2 kidneys, ½ lb. flaky pastry, 1 tablespoonful flour, 1 minced onion, salt, pepper, 1 egg.

Cut the steak into very thin slices; split, skin, core, and slice the kidneys. Mix flour, onion, and seasonings. Dip the meat in flour. Pack loosely into a pie-dish a little above the level. Cover with pastry. Decorate edges with the back of the prongs of a fork. Cut a hole in the centre. Brush top with beaten egg.. Bake in a quick oven to start with to firm the pastry, then reduce the heat and finish cooking.

Stewed Shin of Beef

Take 2 lb. shin beef, 1 carrot, 1 clove, 1 bayleaf, 1 tablespoonful flour, ½ teaspoonful pepper, 1 medium onion, 1½ teaspoonfuls dripping, sprig parsley, 2 teaspoonfuls salt, 1 quart boiling water.

Have the bone cut into one or two pieces. Place the shin with the peeled, sliced onion, carrot, clove, bay-leaf, parsley, salt and pepper in a stewpan. Add water. Cover and bring to the boil. Simmer for four hours. Melt the dripping in a saucepan. Stir in the flour, then gradually stir in half a pint of the water in which the meat was boiled. Stir till boiling. Boil two minutes. Add meat and marrow from the bone. Serve with boiled or mashed potatoes. Use the remainder of the liquid as the basis of a vegetable broth.

Beef Olives.

Take 1 lb. stewing steak, 2 teaspoonfuls flour, 1 tablespoonful diced turnip, 1 tablespoonful diced carrot, salt, pepper, 1 tablespoonful dripping, 1½ oz. chopped ham, 1 heaped tablespoonful parsley, 5 heaped tablespoonfuls breadcrumbs, salt, pepper, herbs, stock.

Mix the crumbs with the chopped ham, parsley, salt, pepper, and herbs to taste. Add enough extra stock to moisten well. Divide the steak, cut into a thin slice, into four or five portions. Spread with the ham mixture. Roll up each portion and tie firmly with string. Dip in seasoned flour. Brown in smoking hot dripping in a frying pan. Place in a casserole. Brown the vegetables and add to the casserole with the stock. Cover and simmer for three and a-half hours. Serve with mashed potatoes.

Hamburg Rolls.

Take 3 cupfuls minced beef, 1 cupful rice, cabbage leaves, tomato sauce, salt, pepper.

Mix the meat with the rice, which has been boiled in plenty of salted water, till tender. Cook the cabbage leaves in boiling salted water for two minutes, then drain well. In the middle of each leaf put two tablespoonfuls of the mixture, seasoned to taste, and fold the leaf over. Place in a buttered fireproof dish. Cover with tomato sauce. Bake for one hour and serve.

Pot Roast of Beef with Cabbage.

Take 3 lb. brisket, 1 cabbage, 2 tablespoonfuls dripping, 1 small onion, 2 tablespoonfuls vinegar, 2 tablespoonfuls sugar, salt and pepper.

Melt the dripping in a saucepan. Shred the cabbage. Peel and mince the onion. Cook the vegetables in dripping until brown. Season to taste with salt and pepper. Place the meat in another saucepan. Cover with cold water. Cover and bring to the boil. Add cabbage and onion. Simmer till both are tender. Add vinegar and sugar, and, if not thick enough for your taste, thicken the gravy with a little cornflour dissolved in water. Bring to the boil and cook till smooth.

IN THE FARM GARDEN.

THE GARDEN COMPOST HEAP.

THE garden compost heap is a cheap means of converting garden and household vegetable refuse into valuable fertilizing material. Materials such as lawn clippings, spent crops free of disease, vegetable tops, &c., should all be used in this manner, but the coarse, woody stalks of strong-growing plants should not be used.

The production of artificial manure from garden waste, straw, &c., consists in the decomposition, by fungi and bacteria, of much of the plant material. The nitrogen in the process is converted from an inorganic to an organic form, and is present in increased amount in the material finally produced. The rapidity with which the process goes on is influenced by the type of material, its degree of maturity and chemical composition, and by the presence of nutrients such as lime, phosphate, nitrogen, and potash, for the organisms carrying on the decomposition are much akin to plants in their requirements.

Actual damage can be done to crops, other than some legumes, by the addition of uncomposted, poor-quality material to the soil. This damage is due largely to a lack of available nitrogen in the soil. Such poor-quality materials as bush scrapings, dry mature grass or straw, offer a good source of energy for the soil bacteria and fungi, which rapidly increase in numbers, and in so doing consume all the available nitrogen. This competition for soil nitrates results in the nitrogen starvation of crop plants.

The usual process of allowing plant refuse to decay without any chemical treatment results in a very acid product, providing no immediately available nitrogen. With nitrogen-poor plant residues it becomes necessary to add available nitrogen to the heap, as well as lime, which prevents the development of acidity, and phosphate, which is required in the nutrition of the organisms. With nitrogen and mineral-rich materials such as legumes (peas, beans, &c.), green vegetable tops, and other green succulent material, the use of lime alone should be sufficient to enable rapid decomposition.

With general refuse or poor-quality material, a heap can be made on a square base, and of such size that the final height is about 3 feet. Spread the chopped-up material in layers several inches deep, treating each layer in the following manner:—

Snow over with ground limestone (5 lb. per 100 lb. material), fork in loosely, give a sprinkling of superphosphate, and then add sulphate of ammonia at the rate of 1½ lb. per 100 lb. material. The material should be moistened before building up the layers, if not already moist. Ammonia may be given off slowly, so that it is necessary to keep building up and treating the successive layers quickly, so that it will not be lost. The final layer is not treated, and may be given a covering of an inch of soil. When next the heap is added to, the untreated layer can be moistened and treated.

When the heap is at the full height, after subsidence due to compaction and loss of material by bacterial action, the heap can ferment under the untreated capping, which can be used as a base for the next heap. The heap should be kept damp, but water should not be added in quantity sufficient to cause drainage from the heap.

In summer the material should be ready for use after two months, but in cold weather the process is much slower.

Artificial manure properly prepared is very similar in chemical composition to composted horse manure, and gives equally good results in promoting plant growth.

LIME FOR THE GARDEN.

Lime fulfils many functions which are essential to soil fertility. Its most useful action is in neutralising the acidity of strongly acid soils, for with the removal of acidity the other valuable effects of liming follow. Lime improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier. It is an essential plant nutrient, and when present in sufficient amount promotes many phases of bacterial activity, especially those ultimately bringing the reserves of nitrogenous material in the soil into the soluble forms of nitrogen so advantageous to plant life.

There is no foundation for the common statement that exposure of acid soil to sun and air "sweetens" or reduces its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or by the loss of lime, through leaching, and absorption by plants. Acidity thus developed can only be counteracted in field or garden practice by the use of some form of lime, such as hydrated or slaked lime, and ground limestone or carbonate of lime.

Slaked lime is formed by the action of water on burnt or stone lime, and forms a very fine powder which can be spread efficiently. Ground limestone is a cheaper and more pleasant material to handle than slaked lime, and can be relied on nearly always to give as quick and good results as slaked lime, provided the material is sufficiently fine and well distributed, and that equivalent dressings are applied. In the last respect, 4 lb. of carbonate of lime are required to supply as much "effective" lime as 3 lb. of slaked lime contains.

The soil to be limed should be dug over and reduced to good tilth, the lime spread uniformly and then worked lightly into the top several inches of soil. The amount of lime to be used depends on the degree of acidity of the soil, its texture, organic content, and the type of plant to be grown. Unless all these features can be determined, suggestions on the amount of lime to be added to a soil can only be approximate.

On loams and heavier soils, dressings may range from 1 lb. of slaked lime, or 1½ lb. ground limestone, per square yard on loams, to double these quantities on clay loams and clays. Sandy loams or still more sandy soils can receive lighter dressings of approximately half the amount for loams. Lime is lost most rapidly from sandy soils, which are usually more acid than heavier soils under the same conditions. Under garden conditions, with frequent waterings, lime is continually being lost, especially from the sandier types of soil. After the initial liming, which may need to be heavy to counteract strong acidity, it is preferable to add light dressings each season, rather than occasional heavy dressings.

It is not necessary always to add sufficient lime to neutralise soil acidity completely, as most garden plants grow well on slightly acid soils. This slighty acid condition will only result in the majority of garden soils after liming. Only for those plants listed below as very sensitive to acidity is it advisable to neutralise acidity completely. Whilst many plants grow best on neutral soils or on slightly alkaline soils, a considerable number of plants will tolerate fairly acid soils. The latter are not affected adversely by being grown in limed soils, though many plants which require a good lime supply may fail on acid soils.

By careful planning of the garden cropping scheme, portion of the area may be set apart and only lightly limed, if at all, for certain plants (as indicated below), and the remainder limed for those crops with a higher lime requirement. Potatoes do best on slightly acid soils, and in gardens where dry conditions are not experienced the danger from scab diseases in slightly acid soils is small.

The following statement shows the relative sensitiveness of a number of garden and crop plants to acid soil conditions:—

Very tolerant.—Potato, radish, strawberry, sweet potato, rhubarb, watermelon, pineapple.

Tolerant.—Bean, carrot, cucumber, turnip, crimson clover, maize, oats, tomato, cowpea, cabbage.

Sensitive.—Cauliflower, rape, red clover, sweet clover, wheat, white clover, lettuce, onion.

Evidence is available to show that excess of lime under certain conditions may depress plant growth. Overliming may result when the calculated amount of lime is applied to the surface zones of soil, and not worked to the proper depth. Overliming injury is produced only on heavily-limed acid soils, and not on non-acid soils, or soils which have been limed previously. This injury is not permanent and usually is overcome by the time the first crop is removed. Lettuce and lucerne are crops which may suffer from bad lime distribution.

Large additions of organic matter such as compost, manure, &c., are very effective in reducing overliming injury, and this fact is of importance in indicating that a liberal addition of green or stable manure should be applied to the soil if immediate liming and seeding are necessary. Where very heavy dressings of lime are necessary, it may be advisable to apply lime in two successive seasonal applications. After the preliminary liming, the lime added in a well-made compost will go far to counteract natural losses of lime from the soil.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1937.	Aug., 1936.
North Coast.	In.		In.	In.
Atherton	0·87	36	1·31	0·04
Cairns	1·72	55	1·18	0·10
Cardwell	1·27	65	0 26	0·73
Cooktown ..	1·20	61	0·52	0·32
Herberton ..	0·63	51	0·42	.
Ingham	1·46	45	0·21	3·60
Innisfail	4 90	56	5·26	0 07
Mossman Mill ..	1·31	24	0·81	..
Townsville ..	0 50	66	0·01	..
Central Coast.				
Ayr	0·55	50	..	..
Bowen .. .	0·64	66	0·05	..
Charters Towers ..	0·52	55	0·01	..
Mackay	1·03	66	0·31	0·13
Prosperine ..	1·32	34	2·68	0·35
St. Lawrence ..	0·80	66	0·23	..
South Coast				
Biggenden ..	1·07	38	1·11	
Bundaberg ..	1·26	54	1·45	0·58
Brisbane .. .	1·96	85	1·40	0·10
Caboolture	1·51	50	1·61	0 08
Childers	1·20	42	0·80	0·13
Crohamhurst ..	2·17	44	2·94	0·10
Esk	1·44	50	1·09	0·16
Gayndah	1·14	66	1·40	..
Gympie	1·69	67	2 26	0 01
Kilkivan	1·40	58	1·07	.
Maryborough .	1·66	66	0·89	..
Nambour .. .	1·85	41	3·20	0·36
Nanango .. .	1·31	55	1·41	0·08
Rockhampton ..	0·81	66	0·29	0·03
Woodford	1·65	50	1·42	..
Central Highlands	In.		In.	In.
Clermont .	0·68	66	0 05	0·04
Gindie . ..	0·63	38	0 22	0·06
Springsure ..	1·02	68	0·25	0·10
Darling Downs				
Dalby .. .	1·18	67	1·51	0·40
Emu Vale .	1 05	41	2·49	0 39
Hermitage ..	1·12	31	.	0 24
Jimbour ..	1·13	49	1 20	0·22
Miles	1 09	52	1·41	0·36
Stanthorpe .	1·75	64	3 43	0·67
Toowoomba .	1 61	65	2·27	0·06
Warwick	1·42	72	2·90	0·51
Maranoa				
Roma	0·90	63	0 41	0·48
State Farms, &c				
Bungeworgorai .	0 74	22	.	0·40
Gatton College ..	1 08	38	.	..
Kairi .. .	0·91	21	..	..
Mackay Sugar Experiment Station	0·86	40	0·48	0·10

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure. at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points	
Cooktown	29·98	77	67	82	31	59	28	52	4
Herberton	.	71	51	81	20	39	28	42	9
Rockhampton	30·13	75	54	84	20	43	23	29	4
Brisbane	30·17	70	52	78	19	44	5	140	11
Darling Downs.									
Dalby	30·18	69	44	81	20	31	6	151	7
Stanthorpe	..	61	38	73	31	22	5	343	14
Toowoomba	..	65	44	76	31	22	5	227	13
Mid-Interior.									
Georgetown	30·02	84	54	90	19, 20, 30	38	4	Nil	..
Longreach	30·10	78	49	93	31	36	3	22	2
Mitchell	30·16	71	40	89	31	29	6, 23	48	2
Western									
Burketown	30·02	83	58	90	26	49	4	Nil	..
Boulia	30·08	78	50	96	30, 31	40	3, 4, 6	31	2
Thargomindah	30·09	72	47	90	31	35	2	28	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October. 1937.		November. 1937.		MOONRISE. Oct. 1937.	MOONRISE. Nov. 1937.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a m.
1	5·33	5·51	5·3	6·9	3·4	3·28
2	5·32	5·51	5 2	6·10	3·43	4·4
3	5·31	5·52	5 1	6·11	4·18	4·40
4	5·29	5·53	5·0	6 12	4·53	5·21
5	5·28	5·53	5·0	6·12	5·28	6·2
6	5·27	5·54	4·59	6·13	6·5	6 48
7	5·26	5·54	4·58	6·14	6·43	7·36
8	5·25	5·55	4·57	6·15	7·24	8·27
9	5·24	5·55	4·57	6·15	8·6	9·21
10	5·23	5·56	4·56	6·16	8·52	10·14
11	5·22	5·56	4·56	6·17	9·42	11 9
						p.m.
12	5·21	5·57	4·55	6 18	10·34	12·5
13	5·20	5·57	4 55	6 18	11 29	1·1
					p.m.	
14	5·19	5·58	4 54	6·19	12·25	1·58
15	5·18	5 58	4 54	6·20	1·20	2 58
16	5·17	5·59	4·53	6·21	2·17	4 2
17	5·16	6·59	4·53	6 22	3·17	5·10
18	5·15	6·0	4·52	6·23	4·18	6·21
19	5·14	6·1	4·52	6·23	5·21	7·29
20	5·12	6 1	4·52	6·24	6·29	8·33
21	5·11	6·2	4·51	6·25	7·37	9·28
22	5 10	6·3	4 51	6·26	8·33	10·20
23	5·9	6·3	4·51	6·27	9·46	11·4
24	5·8	6·4	4·50	6·28	10·46	11·44
25	5·8	6·5	4 50	6 28	11·37	..
						a.m.
26	5·7	6·5	4·50	6·29	a.m.	12·20
27	5·6	6 6	4·50	6·29	12·23	12·56
28	5·6	6·7	4·49	6·30	1·6	1·29
29	5·5	6·7	4·49	6·30	1·44	2 4
30	5·4	6·8	4·49	6·31	2·19	2·40
31	5·3	6·9			2·53	

Phases of the Moon, Occultations, &c.

4th Oct.	●	New Moon	9 58	p.m.
13th „	☽	First Quarter	1 47	a.m.
20th „	○	Full Moon	7 48	a.m.
26th „	☾	Last Quarter	11 26	a.m.

Apogee, 10th October, at 4 a.m.
Perigee, 22nd October, at 2 a.m.

Mercury, on the 29th, will be on the farthest side of its orbit, beyond the Sun from the Earth. Though it will be nearly 36 million miles from the Sun it will seem to be only about one degree from its disk, lost in its overpowering light.

Observers will have watched with interest the gradual approach towards each other of the two most brilliant objects in our evening sky, Mars and Jupiter. Since the middle of August, Mars has been travelling on its normal eastward course from the head of Scorpio into Sagittarius, while Jupiter has apparently moved westward, until on 15th September it resumed its direction eastward. By the end of October the little world, more nearly like our own, will be very near the giant sunlike planet. On the 30th, at 3 a.m., Mars will appear to be only 1½ degrees south of Jupiter.

Mercury rises at 4.35 a.m., 58 minutes before the Sun, and sets at 4.43 p.m., 1 hour 8 minutes before it; on the 15th, it rises at 4.56 a.m., 1 hour 22 minutes before the Sun, and sets at 5.12 p.m., 46 minutes before it.

Venus rises at 4.10 a.m., 1 hour 23 minutes before the Sun, and sets at 3.34 p.m., 2 hours 17 minutes before it; on the 15th, it rises at 4.7 a.m., 1 hour 11 minutes before the Sun, and sets at 3.55 p.m., 2 hours 3 minutes before it.

Mars rises at 10.16 a.m. on the 1st, and sets at 12.18 a.m. on the 2nd; on the 15th, it rises at 10.7 a.m., and sets at 12.1 a.m. on the 16th.

Jupiter rises at 11.40 a.m. on the 1st, and sets at 1.26 a.m. on the 2nd; on the 15th, it rises at 10 53 a.m., and sets at 12.33 a.m., on the 16th.

Saturn rises at 5.17 p.m. on the 1st, and sets at 5.31 a.m. on the 2nd; on the 15th, it rises at 4.18 p.m., and sets at 4.32 a.m.

The Southern Cross will be upright at midday on 1st October, and at its lowest position at midnight on or near the 150th meridian, and will therefore be lost to the evening sky, only the pointers are showing above the horizon.

While the fine constellation Scorpio will disappear in the west the most brilliant of all star groups, Orion, will arise in the east.

3rd Nov.	●	New Moon	2 16	p.m.
11th „	☽	First Quarter	7 33	p.m.
18th „	○	Full Moon	6 10	p.m.
25th „	☾	Last Quarter	10 4	a.m.

Apogee, 6th November, at 8·0 p.m.
Perigee, 19th November, at 11·0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees, 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate; as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

Agricultural Standards.

"IN the final analysis, we can only hold our export markets if our standards of production are at least equal in all respects to the standards of our competitors," declared the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, in the course of a recent address.

"The problems of farming," he added, "fall under three headings: (1) That which the farmer himself appreciates and solves; these are largely cultural problems associated with the varying phases of routine farming practice. (2) That set of problems needing for their solution the co-operation of the producer and the Department—the Department to instruct and the farmer to apply; and (3) that set of intricate questions that are by their very nature entirely within the province of the research officer. Agricultural research is at the root of all progress. Stability, advancement, and, indeed, preservation, all demand a vigorous research policy, and to-day the research division, in close association with the various other branches of the service, are engaged on work in connection with cotton, maize, wheat, peanuts, tobacco, fruit, grasses, fertilizers, soil research—chemical and bacteriological—and indeed in all branches of production.

"One of the happiest indications for the future is the degree of co-operation we are able to obtain from the farmer. The day of the centralised experiment farm is past, and the best work being done is on the farm plot situated on the holding of an approved farmer. 'It is clear that such co-operation is essential, if a successful programme of work is to be carried out."

Agriculture in Queensland.

IN his annual report to the Minister, the Under Secretary and Director of Marketing, Mr. E. Graham, makes a general appraisal of the agricultural and live stock situation in Queensland. It is clear, he remarks, that farmers as a body appreciate the value of technical advice, and that they are eager to make full use of the instructional services of the Department. They are realising the importance of soil conservation —the prevention of erosion by wind and water. A wider appreciation of the fact that correct fertilization means something more than the mere application of crop stimulants is evident. The storage of plant foods in the soil as sound practice is recognised to a greater extent. Rotational cropping and grazing in our farming system is becoming more general. The belief that success in agriculture can only be achieved by planned methods is well established. The necessity of making provision against fodder shortage has been demonstrated to a greater degree than at any other time in the history of the industry. Protection and improvement of native grasses have been bracketed with the establishment of sown pastures of proved stock-feeding value. Swards of introduced grasses are extending widely, especially in areas where climatic and other conditions are conducive to their rapid growth. The necessity of correct pasture management and the evils over grazing are kept continuously before stockowners.

A systematic campaign for livestock improvement and the raising of standards of animal husbandry has been entered upon. The control and eradication of stock diseases have been continued with vigour.

Soil erosion, as one of the greatest menaces to rural industry, is receiving the earnest attention of the department, and for the purpose of devising practical schemes of prevention the Soil Erosion Committee was brought into being.

The Government, fully cognisant of the importance of agriculture in the economy of the State, once again came to the assistance of farmers, who through the stress of seasonal adversity were forced to look beyond their own boundaries for fodder, either to maintain dairy herds in production or minimise stock losses in districts where the drought was most severe. An effective organisation was established in co-operation with butter factory directorates. Molasses and other food materials were supplied at bare cost at reduced transport rates. This prompt action in a time of emergency helped materially to tide the dairy industry over a period of very great difficulty.

Once again it is very pleasing to be able to record an excellent spirit of co-operation between the department and every section of primary producers. A continuance of this spirit of mutual help is obviously essential to the progress of the State. It is felt, however, that the Department should not be regarded as of use only in time of need, and that it should be realised more widely that the work of the Department has been planned with the object of ensuring better conditions for the whole countryside. It is, therefore, to the advantage of the entire body of producers to make full use of the facilities provided for them.

Agriculture the world over is confronted with special and extremely intricate problems, of which the marketing and distribution of primary products remain among the most perplexing. To be reasonably profitable, primary industry must have prices for its products which are higher than its fixed charges and production costs. This is plainly impossible when supplies greatly exceed effective demand. In this connection, it is interesting to observe the world-wide growth of economic regulation, not only in trade but in production. In an entirely altered world economic system, a purely competitive and wholly unregulated agriculture can no longer survive. The necessity of readjustment of agriculture to permanently changed conditions has to be accepted. A truism worth repetition with emphasis is that, if economic equilibrium between market prices and production costs is to be attained, a concentration on production costs is a necessity; but not, of course, at the expense of the quality of the product.

Farmers have become impressed more deeply with the importance of the business side of the land industries. The necessity of economic foresight and insight has been forced upon them.

The days of extensive farming are rapidly passing. Intensive farming is taking its place. With the passing of the years competition for markets is becoming keener, and only products of the highest quality can maintain their hold.

In the further development of agriculture and related industries in Queensland, due appraisal must be made of all the factors influencing production, manufacture, marketing, and distribution. There is nothing static about the policy of the Department. Reorientation to constantly shifting situations is often essential. New problems arise and have to be faced. An elasticity in policy must, therefore, be conceded, for pace must be kept with changing conditions and requirements. Agriculture, consequently, is subject to continuous economic investigation and adjustment to altering circumstances.

Animal Health.

THE work at the Animal Health Station, Yeerongpilly, progressed steadily during the year. This applies particularly to the tick-fever inoculation work in respect of the number of stud animals inoculated, bleeders, and doses of blood supplied.

Investigational work in connection with the recent outbreak of "three-days' sickness" is being carried out with the co-operation of the entomological and veterinary staffs of the Queensland University and the Council for Scientific and Industrial Research. In co-operation with the Health Department, experiments are in progress for the purpose of investigating the aetiology and pathology of "Q" fever. In conjunction with the Agricultural Chemist, work also is proceeding in connection with cattle losses due to the saw-fly larvæ.

A wide variety of diseases affecting the domestic animals and birds were encountered in addition to those mentioned, and the following are among the most important:—

Arsenical poisoning in cattle and sheep; ergot poisoning in cattle; plant poisoning in cattle and sheep; contagious pneumonia in pigs; hæmorrhagic septicæmia of pigs; posterior paralysis of pigs; filariosis of dogs; bacillary white diarrhœa of chicks; coccidiosis of poultry; and blackhead in poultry.

The Use of Acetylene to Induce Flowering in Pineapple Plants.

H. K. LEWCOCK.

IT has long been known that pineapple plants may be induced to flower prematurely by exposing them to smoke fumes for periods ranging from twelve to twenty-four hours. For many years pineapple growers in the Azores have taken advantage of this knowledge to control the blossoming period of their crops by using smudge pots in their glasshouses. From time to time, growers in Queensland have reported premature flowering in pineapple plants which have been exposed to smoke from neighbouring bush fires. In several instances this has occurred in suckers even prior to planting. It was not until comparatively recently, however, that the action of smoke in stimulating flowering was investigated. One of the constituents of wood smoke is a gas known as ethylene and it has been found that it is this gas which provides the stimulus which causes flowering when pineapple plants are exposed to smoke. Researches conducted in Hawaii have shown that acetylene gas is equally as effective as ethylene in inducing flowering in pineapples and that it is both cheaper and more convenient to use under field conditions, since it can be dissolved in water and applied in that form. This is the method of application which has been adopted in Hawaii and which is now recommended for use in Queensland. Applied in this manner, the acetylene treatment has not been found to exert any adverse effect either on the plant itself, its sucker growth, or on the quality of the fruit it produces. (Plate 216.)

Advantages of the Acetylene Treatment.

In Hawaii the acetylene treatment has found general application, firstly, as a means of spreading the harvest peak over a much longer period than it normally occupies and, secondly, as a means of forcing would-be "holdover" plant crop and ratoon plants into flower.

Under Queensland conditions, the acetylene treatment possesses obvious possibilities not only as a means of supplying market requirements for fresh pineapples at times when supplies are normally inadequate, but also as a means of reducing cannery losses from black heart and brown speck by advancing the ripening period of a large proportion of the winter crop from July and August to April and May.

Experiments have shown that, by the use of the acetylene treatment, it is possible to force plants into flower during October and November which normally would not blossom until the following February and March. Plants which flower during the latter months produce fruits which ripen during July and August and these, because of the short day periods, low temperatures and other unfavourable climatic conditions during ripening, are of poorer quality than those harvested at any other time of the year. Moreover, largely because of their low sugar content, fruit which mature during these months are particularly subject to black heart and other internal diseases. By forcing the plants which bear this fruit to flower some three or four months earlier, they would mature their crop during March, April and May, at which time climatic conditions are favourable for the production of yellow-fleshed fruit of high sugar content. Advancing the flowering period

Plate 216.

Acceleration in time of fruiting of pineapples resulting from treatment with acetylene. The fruiting (acetylene-treated) plants in the foreground were planted at the same time as the untreated plants at the rear.

of such plants may therefore be expected to result in a marked improvement in the quality of their fruit and, at the same time, greatly reduce losses from black heart and other winter diseases. For reasons of quality alone, however, it seems highly desirable that the bulk of the pineapples intended for canning should be harvested during the months of February to May, and the fact should not be lost sight of that the production of high quality fruit results in a higher net return to the grower, since a higher canning quality is synonymous with an increase in weight per unit volume of fruit. In Hawaii, approximately 95 per cent. of the crop is harvested during the summer and autumn months, not because of climatic and other chance factors, but because production methods have all been designed to achieve this very desirable objective. Moreover, plants which fruit at this time of the year customarily produce many more slips than those which fruit during the winter months and slips are generally recognised as the preferred type of planting material.

Precautions to be observed in using the Acetylene Treatment.

Because acetylene gas can be dissolved in water, it has been possible to devise a very simple, cheap and efficient method of using it on pineapple plants. Approximately one-eighth of a pint of a saturated or nearly saturated solution of the gas is introduced into the heart of each plant or sucker, where it is retained in contact with the growing point by means of the "cup" formed by the upper whorls of leaves. Provided no rain falls within twenty-four hours, only a single application of the solution is necessary to induce flowering to take place. Should rain fall during this period, however, the treatment must be repeated. Since dew collecting in the cupped heart leaves dilutes the acetylene solution in the same way as a shower of rain, it is usually undesirable to apply the solution during the forenoon.

One cubic foot of water will dissolve approximately the same volume of acetylene gas, but even this relatively small degree of solubility is not readily obtained unless the gas is confined in an enclosed space under pressure. Since undue pressure will cause acetylene gas to explode spontaneously, it is necessary to observe certain precautions in preparing the solution. If the instructions which follow are strictly adhered to in every detail no risk whatever is entailed in using the acetylene treatment. However, unauthorised or haphazard methods of preparing the solution may result in serious accident and therefore should be avoided.

Procedure used in conducting Experimental Trials.

In the experiments and trials which were conducted during last spring and autumn, a method of preparing the solution was employed which involved introducing a weighed quantity of carbide into a petrol drum partly filled with water and, after replacing the bung, agitating the drum until a saturated solution of the gas was obtained.

Publicity was not given to the details of this method because it involves careful calculation of the quantity of carbide required, since this varies with the cubic capacity of the drum employed and the extent to which it is filled with water. A slight excess of carbide results in a rapid increase in pressure within the drum and if this should exceed 30 lb. per square inch the gas will explode spontaneously. While of value for experimental purposes, this method is obviously unsuitable for general use.

Procedure Recommended for Preparing the Acetylene Solution.

After the effectiveness of the acetylene treatment under Queensland conditions had been demonstrated by experimental trials, attention was given to devising a safe, simple and efficient method of using it under the limitations imposed by local farming practices. The method about to be described has been found to meet all these requirements. It has been worked out with the co-operation and assistance of the Queensland Oxygen Pty. Ltd., whose engineers have thoroughly familiarised themselves with the field aspects involved.

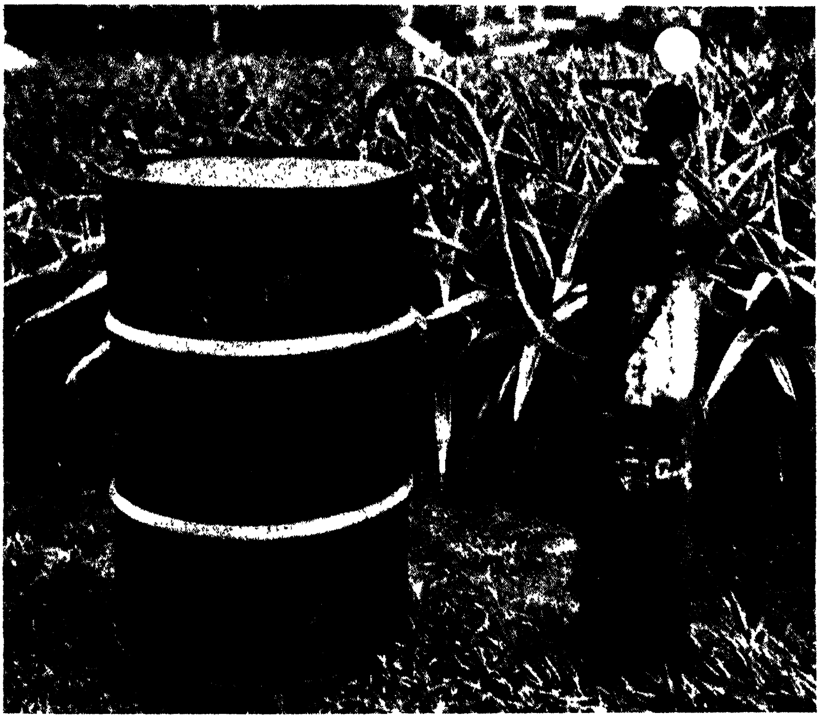

Plate 217.
Equipment set up for preparing acetylene solution.

In this method, which is the only one recommended at present, compressed acetylene gas contained in a special type of steel cylinder is conveyed into a petrol or oil drum filled with water until a saturated solution of the gas is obtained. This is accomplished in the manner depicted in the accompanying diagram (Plate 218). The steel cylinder (A) is connected to the petrol or oil drum (B) by means of rubber tubing (C). As the gas leaves the acetylene cylinder it passes through a regulator and pressure gauge (D) which controls the flow at a fixed pressure, namely, 9 lb. to the square inch. As a special safety precaution, this regulator is so arranged that when the pressure exceeds 15 lb. per square inch the gas automatically blows off to atmosphere by means of a safety valve. It is particularly important that the adjustments on this regulator should not be tampered with in any way, since they have been set to give the maximum degree of efficiency and safety.

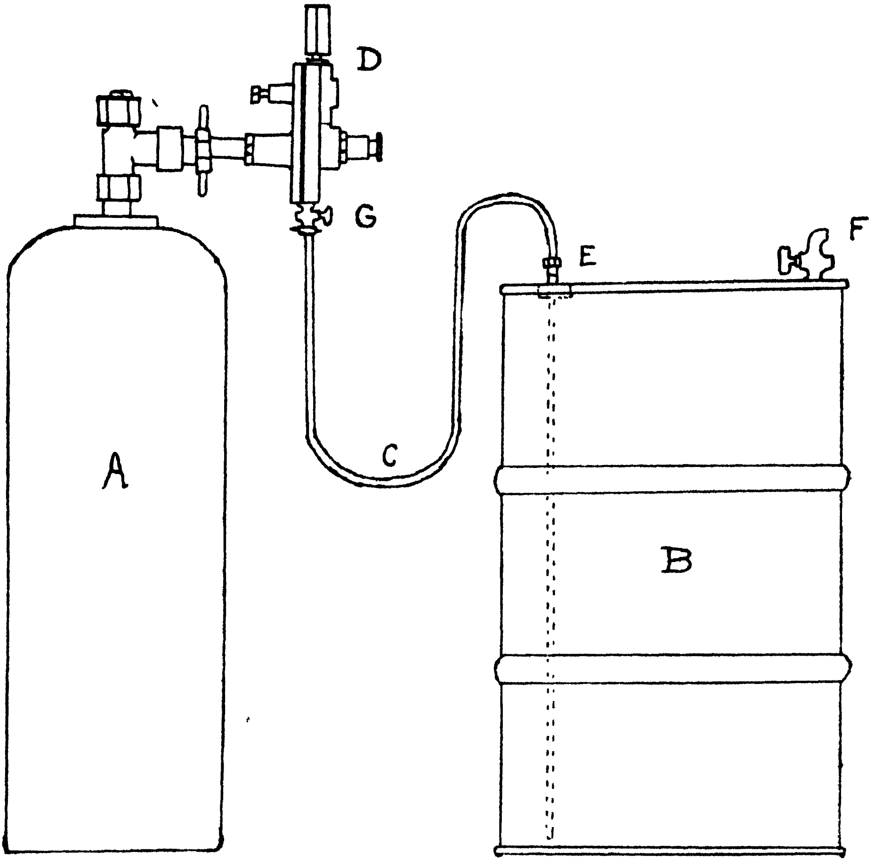

Plate 218.
Diagram of equipment for preparing acetylene solution.

Method of Preparing and Applying the Acetylene Solution.

In operation, the rubber tubing which proceeds from the regulator is connected to a fitting (E), which in turn screws into the large bunghole of a 44-gallon petrol drum filled with water to within about 4 inches of the top (approximately 40 gallons). If the drum used is of the type in which the large bunghole is on the side instead of on one end, the copper tubing attached to the fitting (E) must be shortened accordingly. Before using a new drum, it is important that all dregs of petrol should be thoroughly washed from the drum by filling it to overflowing with water.

After the equipment has been connected up in the manner indicated and the cock (G) on the bottom of the regulator has been turned to the "on" position, the valve on the gas cylinder is opened carefully by means of the cylinder key which is provided. This key should not be given more than one full turn; a half turn or less will usually provide

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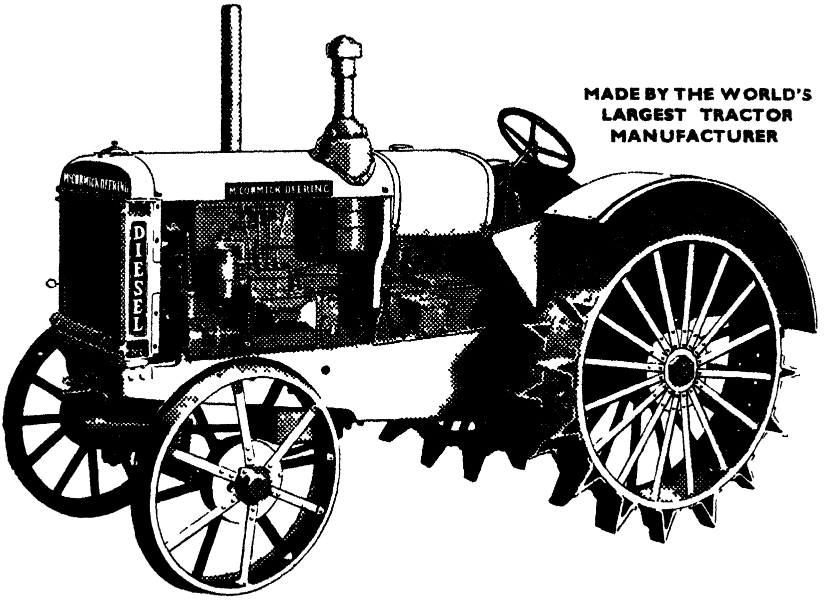

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an adequate flow of gas. As soon as the gas is turned on, the water in the drum is agitated by rocking the drum from side to side until the needle on the pressure gauge registers a pressure of 9 lb. per square inch. The gas flow should then be turned off at the cylinder valve by means of the cylinder key and the drum should be further agitated until the needle on the gauge falls to zero. This operation is repeated until the needle on the pressure gauge no longer drops when the drum is agitated, but remains stationary at from 7 lb. to 9 lb. pressure. At this stage, which should be reached in from five to ten minutes, the water in the drum is fully saturated with acetylene and the solution is ready for use. Before it can be drawn from the drum, however, the cylinder valve must be turned off tightly, the cock on the regulator shut, and, with the drum standing on its end, the water tap (F) opened to allow any free gas contained in the drum to escape. When this has been done, the rubber tubing leading from the drum should be disconnected from the regulator and the water tap (F) closed, after which the drum may be laid on its side to permit of easy withdrawal of the solution.

From the drum, the solution is run off through the tap (F) into the containers from which it is to be applied to the plants. An ordinary knapsack or pneumatic sprayer may be readily adapted for this purpose by replacing the normal nozzle with a 3/16-inch jet fitted with a trigger release (Plates 219 and 220). The tanks supplied with certain types of flamethrowers are even better suited for applying acetylene solution, since they are designed to hold a relatively high pressure with only intermittent pumping. Consequently, when using the latter type of equipment, one hand is free to move away obstructing leaves, and the application of the solution is thereby greatly facilitated. (Plate 221.) If neither of these containers is available, however, the solution may be applied from a bucket by means of a long-spouted coffee-pot or similar utensil.

Irrespective of the type of equipment which is employed for applying the solution, care should be exercised to introduce it squarely into the hearts of the plants which it is desired to force into flower. Each plant should receive sufficient solution to fill completely the receptacle formed by the cupped heart leaves. In practice, it will be found that one gallon is ample for sixty applications.

It is more satisfactory to prepare the acetylene solution at or near the tank or well from which the drum is filled, rather than in the plantation itself. A convenient method of arranging this is to mount the drum on a truck or slide so that it can be easily and quickly transported to and from the field. Such an arrangement has an additional advantage in that the clearance provided between the bottom of the drum and the ground facilitates the filling of the containers employed for applying the solution to the plants, particularly when the solution in the drum is nearing exhaustion. Agitation of the drum while the solution is being prepared is likewise facilitated by standing or laying it on a short piece of round wood about the thickness of a broom handle.

Cost of the Acetylene Treatment.

Approximately 2,400 plants can be treated with each drum full of solution, viz., 40 gallons. Since slightly less than 8 cubic feet of gas are required to saturate this quantity of water, a cylinder containing

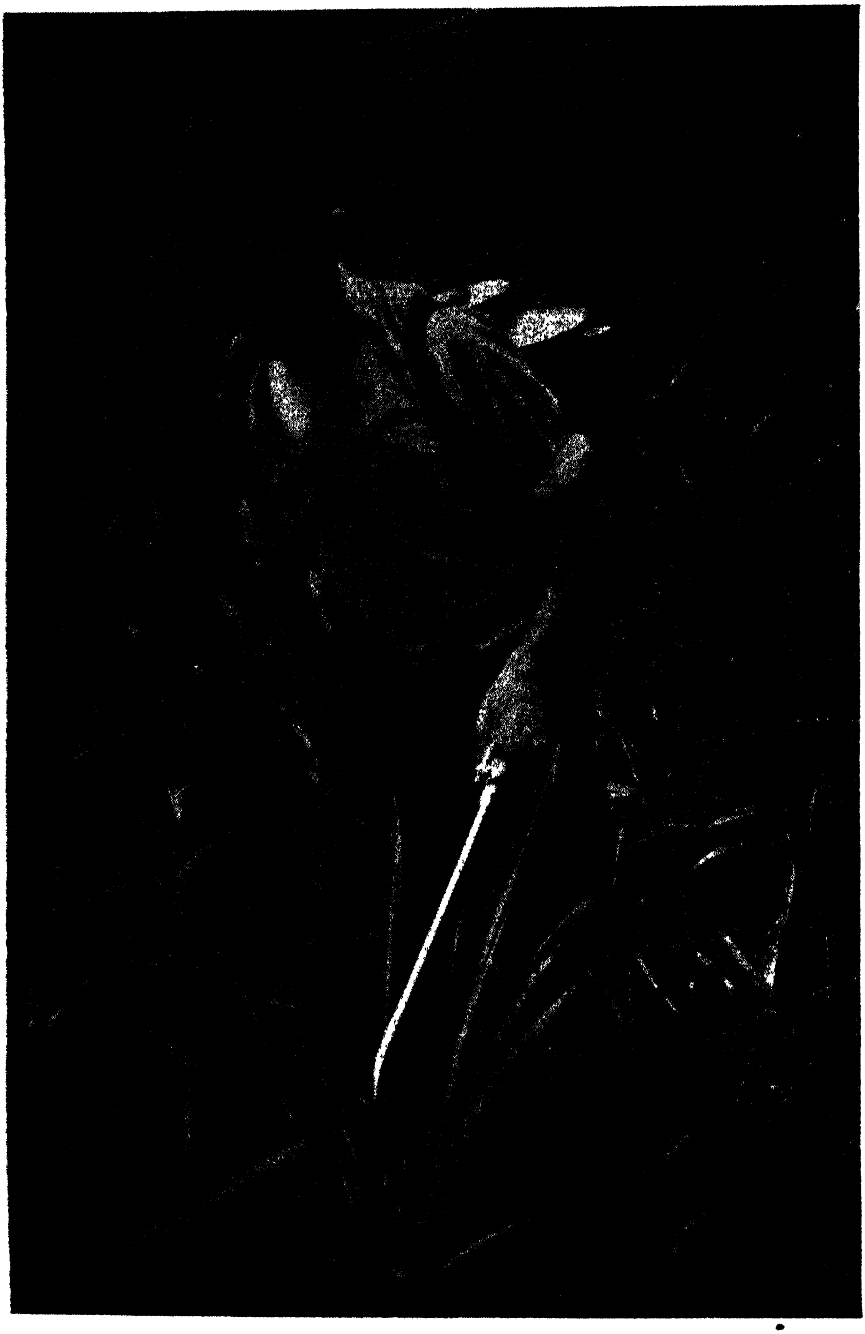

Plate 219.

Applying acetylene solution by means of a knapsack sprayer. Note that one hand is continually engaged in operating the pump.

100 cubic feet of compressed gas should provide sufficient acetylene to treat at least 30,000 plants. At current prices, this would entail an expenditure for materials of approximately 8d. per 1,000 plants.

Plate 220.

Trigger release and jet recommended for the application of acetylene solution from a knapsack sprayer or flamethrower.

Age at which the Acetylene Treatment may be applied.

By means of the acetylene treatment, pineapple plants can be forced into flower at any stage of their growth provided climatic conditions are favourable at the time the treatment is applied. However, the size of the fruit which will develop is determined by the size and vigour of the plant or ratoon receiving the treatment. Even under the most favourable growth conditions plants are rarely large enough for treatment before they are ten or twelve months old. (Plate 222.) When treated at this age, well-grown plants should yield fruit corresponding in size and weight to those which are normally obtained from untreated plants. Plantings made in the late spring or early summer

Plate 221.

Applying acetylene solution by means of a flamethrower. Note that the type of pump employed permits the operator to use one hand for moving away obstructing leaves.

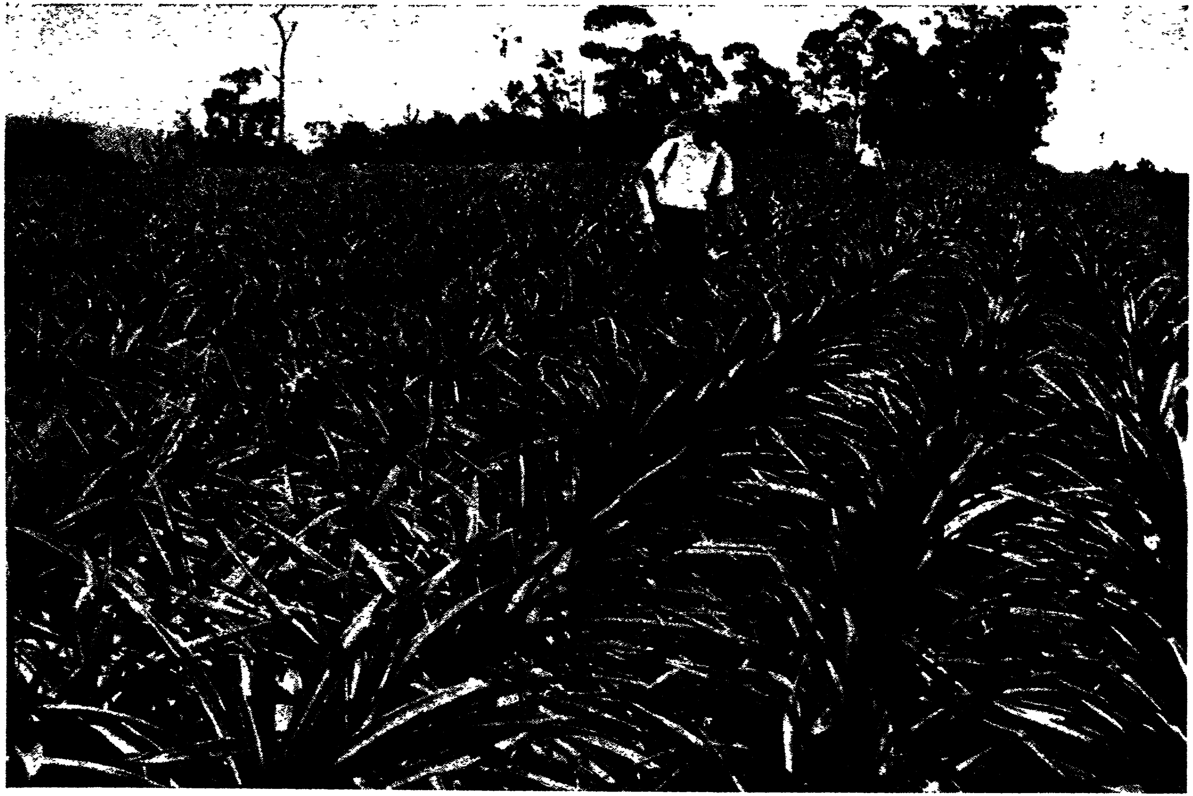

Plate 222.

Application of acetylene solution in a replanted field at Woombye (planted December, 1936). Young plants should not be treated before they have attained a stage of development similar to that depicted above.

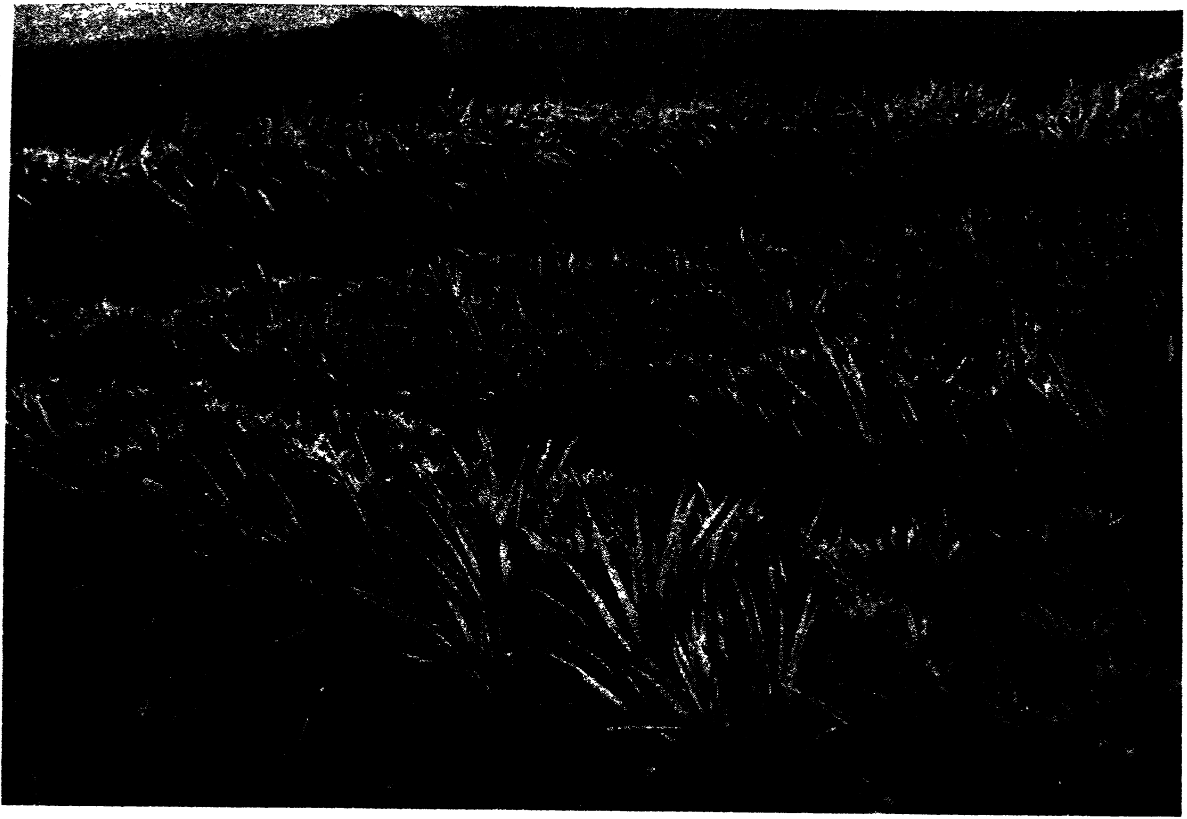

Plate 223.

Partially-developed fruits on acetylene-treated plants in the Dayboro' district. Treatment applied 29th October, 1936; photographed 4th April, 1937.

of one year will usually be sufficiently advanced for treating at about the same time in the following year. Suckers in ratoon fields should be similarly well developed before the acetylene treatment is applied.

The production and development of suckers and slips is not affected in any way by the acetylene treatment, provided discrimination is exercised in regard to the size and vigour of the plants to which the treatment is applied. The extent to which these vegetative organs are produced depends almost entirely on inheritance factors and on the vigour of the parent plant.

Time of Application.

Field experiments indicate that, under the climatic conditions existing in Southern Queensland, response to the acetylene treatment is likely to be uncertain if it is applied before the middle of September or after the middle of March. Applications made between these months should induce flowering in from six to eight weeks. Following earlier or later applications, however, the interval between treatment and flowering is considerably lengthened, and may run to twelve or fourteen weeks. Moreover, while late spring and summer applications may be expected to prove between 80 and 100 per cent. effective, those made during the colder months are likely to prove most unreliable and sometimes wholly ineffective.

Despite these limitations the acetylene treatment will probably be found to meet all normal requirements. Plants treated early in November should mature their fruit during May (Plate 223), a time when supplies are frequently inadequate for the needs of the fresh fruit markets; while it appears likely that the usual November-December shortage can be met by treating holdover plants or suckers during February. Applications made during the first half of March are almost equally effective as those made earlier in the summer, but the fruits which develop from these late applications may not mature until the following Christmas or New Year and, in addition, they are likely to be "prickly-eyed."

It will be noted that there is a wide variation in the interval which elapses between the application of the treatment and the ripening of the fruit, according to the seasonal conditions which obtain during this period. It appears that the rate of development of acetylene-forced fruit is influenced by seasonal conditions to the same extent as that produced on untreated plants.

"Don'ts" to be observed in Using the Acetylene Treatment.

Don't treat plants or suckers until they are large enough to bear profitable fruits.

Don't expect satisfactory results from applications made during the autumn or winter months.

Don't treat plants for at least twenty-four hours after rain has fallen, nor when rain is threatening.

Don't smoke or strike matches while preparing the solution—acetylene gas is highly inflammable.

Don't employ any but the recommended method for preparing the solution—acetylene gas explodes spontaneously above 30 lb. pressure.

Don't fail to read the instructions *carefully*.

Diseases of the Papaw.

J. H. SIMMONDS, M.Sc., Senior Research Officer.

UNTIL recent years there has been but little attention focussed on papaw diseases in Queensland, with the result that although the cause of most of them is now known control measures have not yet been worked out in all cases. As would be expected from the soft nature of the fruit, transport rots are a source of considerable loss. The development of disease is aided in Southern Queensland by winter conditions, which are often too severe and variable for a tropical plant such as the one under discussion.

BLACK SPOT.

Black spot is widely distributed throughout Queensland, where it is probably the most serious disease to which papaws are subject. All the aboveground parts of the plant, with the exception of the leaves, may be affected.

On the fleshy white flowers and very young fruit there develop brown areas of decay which later turn to conspicuous, dark, shrunken spots (Plate 224). The infection often extends back until the stalk is invaded, when the flower or fruit will gradually shrivel up. Fruit older but still green may exhibit a black, circular spot limited in extent to an inch or an inch and a-half in diameter. This type of infection usually occurs where two fruit touch or where a leaf has been lying. In mature fruit the rot takes the form of one or more circular brown spots, distinct or coalescing, which appear on the exposed side of the fruit (Plate 226). This form of injury will be discussed more fully under the heading of ripe rots.

A serious loss arises from the invasion of the main stem. This is usually the result of the disease working in through a decaying flower or fruit stalk, or through the point of attachment of a dead leaf (Plate 224). The dying leaf stalks often act as a source of infection in this way, especially if death has been premature due to winter injury. A somewhat shrunken, brown or black area of decay is set up, and this may extend for some distance and completely cincture the stem so that the upper part of the tree dies.

Studding the surface of the dark, decayed areas are often minute pimples or pustules from each of which a white gelatinous tendril issues in moist weather. The pustules are the flask-shaped fruiting bodies of a fungus (*Ascochyta caricæ*), and the white exuded substance consists of a mass of minute two-celled spores. By inoculating pure cultures of this organism into healthy plants it has been shown to be the cause of the disease.

Black spot is serious during the winter and spring months. In May and June some decay of young flowers and fruit may occur. Later the black spot on green fruit may be in evidence and the ripe rot cause loss in fruit colouring on the tree and during transport. As the weather warms up in the spring and growing conditions improve the disease lessens gradually, and towards the end of the year losses are less serious.

Exposure and cold appear to favour the development of the disease. The papaw is a tropical plant, and if grown in cold, exposed situations, will lose most of its older leaves during the winter months.

The dying leaf stalks afford an opportunity for the fungus to gain entrance to the stem. Also, owing to lack of protection the fruit is exposed to cold winds and the heat of the sun, thus predisposing it to infection. In this connection, it is important to note that maintaining a vigorous growth by the application of suitable cultural methods will reduce the extent of winter leaf injury.

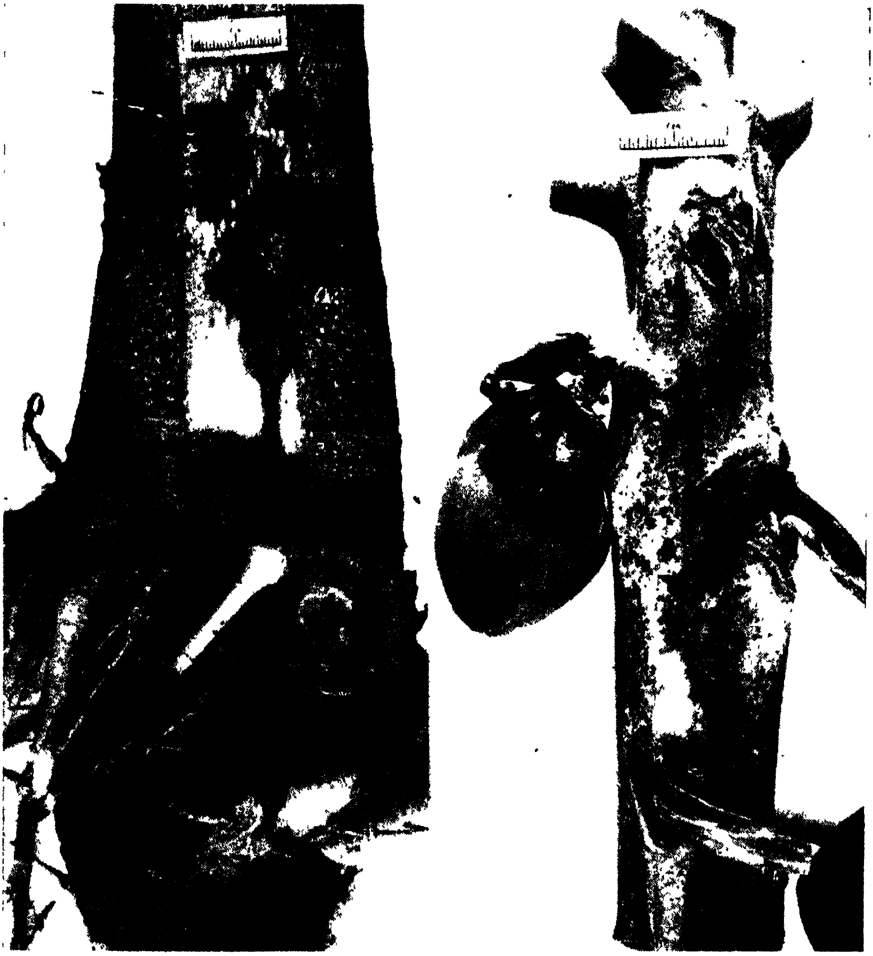

Plate 224.

Left—Papaw affected with foot rot; a strip of bark removed to show the rot below.

Right—Black spot attacking a young fruit and entering the stem through dead leaf stalks. (Note the decay commencing at the point of insertion of the two lower leaf stalks).

Control.

A satisfactory spraying programme for the control of black spot has not yet been worked out. A Bordeaux spray has to be avoided, as it may cause a scorching of the young crown leaves. Only where powdery mildew is also serious can spraying be definitely recommended. It is then suggested that a wet spray of either lime-sulphur, 1 in 35, or colloidal sulphur be applied at approximately monthly intervals, commencing in April and ending in September. A suitable spreader should be added to the spray.

Choose a warm, sheltered situation for papaw growing. Fertilize well in order to obtain a vigorous growth resistant to winter injury. The fertilizer should contain an adequate supply of potash when the plants are in fruit.

Collect and burn any dead leaf stalks which may be removed without injury to the fruit, and also remove spotted fruit from the vicinity of the plantation and packing shed.

Cut off plants affected with stem rot below the point of injury, if possible at one of the stem partitions, with the object of forming a new fruiting stem by a lateral shoot from below.

POWDERY MILDEW.

Powdery mildew is caused by a fungus (*Sphærotheca sp.*) which attacks only the younger parts of the plant. The young crown leaves of an affected tree have a yellow, blotched appearance as a result of the presence of numerous light yellowish-green patches. The lower surface of these is usually speckled with small water-soaked dots, or the whole may have a distinctly water-soaked appearance. By means of a lens, delicate cobweb-like fungous threads may be seen spreading over the surface, usually on the under side. During moist or showery weather short chains of delicate oval spores are given off from these threads, which, in a mass, form conspicuous white floury patches. On rare occasions a second type of spore body appears as scattered grey specks along the main veins and leaf stalk.

Affected leaves often outgrow the disease if the infection is light, but, with the fungus present in abundance, dead areas appear between the main veins and along the margin, giving a brown, scorched appearance to the young leaves. This may result in a severe setback to young trees, and may even cause their death.

Patches of the white floury mildew develop on the young fruit also. In this case, the fruit is rarely killed and the fungus gradually disappears. However, the skin reacts to its presence to produce a superficial grey scar which may be of large size and seriously mar the appearance of the mature fruit. Growth is restricted over the affected area, so that malformation often results as well (Plate 225).

Powdery mildew is mainly a winter trouble. It becomes well established rather earlier than black spot, usually in May and June, and disappears with warm summer growing conditions. There appears to be a definite variation in the susceptibility of individual plants to this disease.

Control.

The fungus causing powdery mildew lives mainly on the outside of its host and, consequently, can be controlled with comparative ease by a sulphur spray or dust. If black spot is present also, the wet spray is preferable. Lime-sulphur 1 in 35 or colloidal sulphur may be used. The addition of a spreader is advisable, since without one it is difficult to cover the young growth. For powdery mildew alone, dusting is to be preferred on account of the ease and speed of the operation. A simple dust containing about 50 per cent. sulphur with lime as a filler is suitable.

It is necessary to concentrate on the young crown leaves and fruit, covering the under surface of the leaves thoroughly. Applications should commence about May, or as soon as the disease makes an appearance. The wet spray will need to be repeated once a month or every six weeks until the end of August. The dust must be applied more often, especially if rain storms are frequent or if the disease appears to be on the increase.

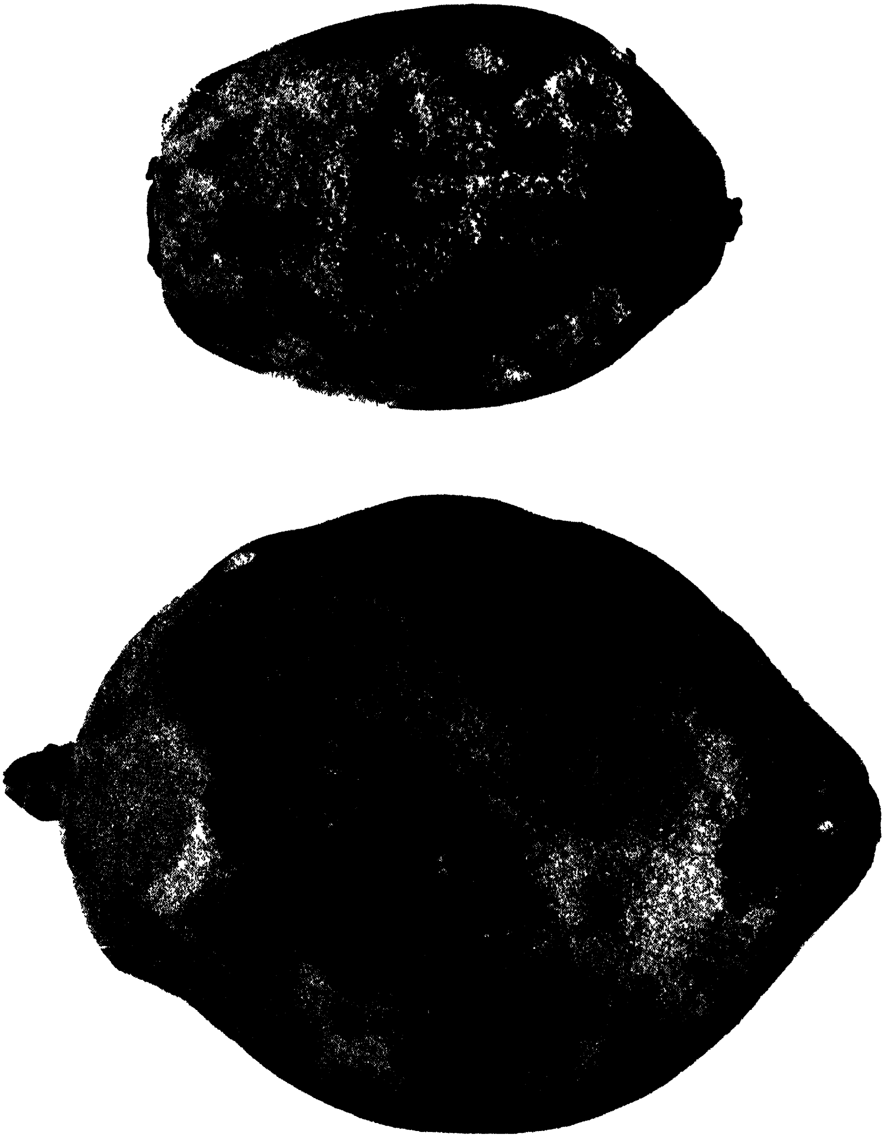

Plate 225.

Powdery mildew of the papaw, showing the fungus growing on a young fruit and the scarring and malformation which develops later.

RIPE ROTS.

The spring and early summer crop may suffer severely from one or more types of ripe rot. Circular brown spots develop in varying numbers on the skin of the mature fruit. These range in size from small, shallowly-depressed spots to large, saucer-shaped depressions an inch or more in diameter. In some cases there may be an exudation of latex into the hollows of the depressions, giving a scabby appearance to the fruit.

This distinct spotting is often preceded by a superficial brown discolouration of the skin, producing a scald-like effect. In some cases this appears to be a true scald brought about by exposure resulting from winter leaf fall, but in other cases it represents an early stage in the development of the ripe rot spots themselves. These, before becoming depressed, appear as small, circular, brown stains on the skin, and, if numerous, may spread and become confluent to form the brown discolouration described above.

Ripe rot of the papaw may be caused by at least two distinct fungi—*Ascochyta caricæ* and a species of *Glœosporium*. In the early stages there is little difference in the spotting produced by these two organisms. In the later stages they are usually distinguishable by the appearance of two distinct types of fruiting body over the surface of the spots. In the case of the former these consist of minute, raised pustules produced on a greyish or black background from which a white pin-point mass of spores is exuded in wet weather. The latter produces pinkish masses of spores which may form a continuous pink layer over the centre of the spot. In the Ascochyta spot the tissue immediately below the surface is firmer than the normal flesh and often conspicuously grey. With a Glœosporium infection there is little change in colour (Plate 226).

Mature fruit may develop the brown scald and spotting while still on the plant, or, as is often the case, apparently sound fruit will become spotted on reaching the market, especially when consigned for long distances. In either case the spots develop typically on the side which on the tree is the exposed outer surface of the fruit. A stem-end rot sometimes follows infection through the wound left by breaking the fruit from the stalk.

Both the abovementioned organisms live and produce spores on dead and dying leaf stalks, and it is probable that much of the infection is derived from this source. Unfortunately, it is usually impossible to remove the leaf stalks without injury to the fruit.

Control.

As the development of the ripe rots appears to be bound up with winter injury, any practice calculated to minimise this is advisable. A satisfactory spray has not yet been found, and recommendations are largely a recapitulation of those suggested for black spot.

1. Select a warm locality and fertilize when necessary, in order to reduce winter injury.

2. Practise sanitation measures as far as possible.

3. Apply a sulphur spray during the winter and spring months if powdery mildew is also present and needing control.

4. Attend to correct picking maturity, as the delayed ripening of immature fruit increases the incidence of ripe rot.

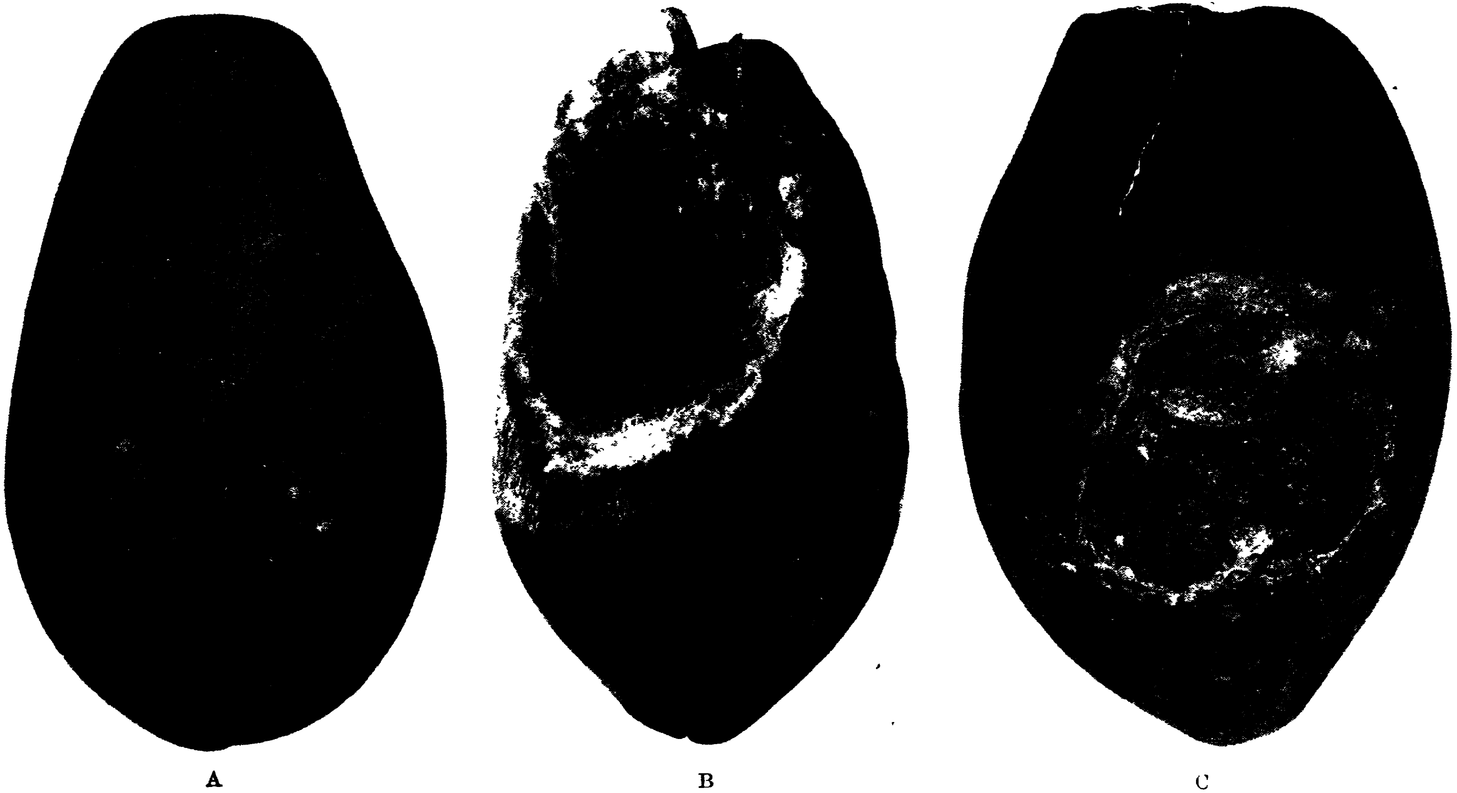

Plate 226.

PAPAW FRUIT DISEASES.

A. The type of papaw ripe rot produced by *Glœosporium sp.* B. Watery rot, showing an abundant development of the fungus *Rhizopus nigricans* on the soft area. C. A well-developed black spot lesion on mature fruit.

WATERY ROT.

Fruit, after it has been picked, occasionally develops a soft, watery decay which rapidly involves a large proportion of the flesh. Apart from a water-soaked appearance, no discolouration is present. The rot is commonly associated with some form of injury, and often with old black spot lesions. It is caused by a common mould fungus (*Rhizopus nigricans*) which may produce wefts of long, grey, fungous threads over the surface of the soft area. In advanced stages these threads may bind fruit and packing material together into a "nest" (Plate 226).

No special control measures are necessary. Fruit should be handled carefully so as to avoid injury, and any damaged or spotted fruit should be omitted from long-distance consignment. Sanitary precautions such as the destruction of rotting fruit in the plantation and packing shed should be taken.

FOOT ROT.

It is essential that papaws be grown on well-drained land; otherwise, during periods of prolonged wet weather, the roots are liable to decay and cause a wilting and death of the plant. This is the result of loss of aeration owing to the waterlogged state of the soil.

There is, however, a definite disease giving rise to a somewhat similar condition. The base of the stem near ground-level develops a soft, spongy rot which may involve the main roots and extend upwards in brown tongues of decay within the pith and woody parts (Plate 224). Externally, except for a dark and somewhat water-soaked appearance of the bark, there is often little to attract attention. The final effect is a wilting or gradual decline of the plant.

This rot is caused by a fungus (*Pythium ultimum*) which can sometimes be seen forming a white, mould-like growth on the bark covering the rotting region, and also masses of fine fungous threads in the adjoining pith cavities. Both young and old plants are affected by the disease, which usually appears only in fairly isolated cases.

Control.

1. Dig out and burn the stem of any plants developing this disease in order to prevent further spread. Do no replant in the same hole for some time.

2. Avoid injuring the base of the plant during cultivation, as the fungus may gain entrance through the wounds.

3. If the land is flat and liable to flooding, young plants should be set out on hills.

YELLOW CRINKLE.

In a plant affected with yellow crinkle the older leaves exhibit a yellow colour and the petioles take up a characteristic drooping habit. The young leaves develop thin, translucent areas along the margin and between the main veins and, as they expand, these weak chlorotic portions break away, leaving holes in the leaf and a ragged margin. These leaves as they mature have a somewhat hard and crinkled appearance, and usually remain a lighter yellowish green. The very young leaves are characterised by a talon-like incurving of the tips of the segments (Plate 227). Gradually the older foliage falls off, leaving a bare stem crowned with a few stunted leaves conspicuous by their

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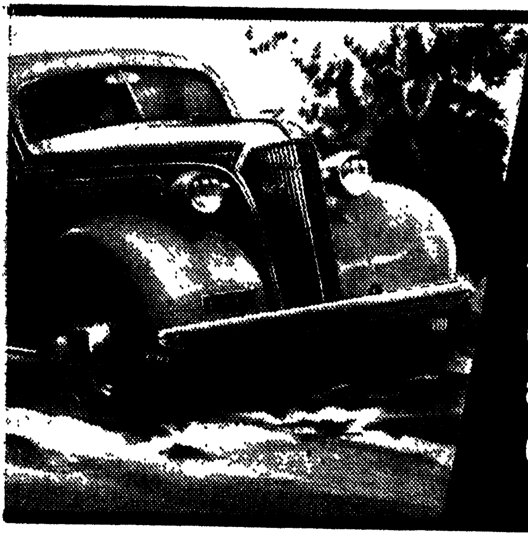

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puckered appearance and indented margin. The floral parts, if present, may develop into abnormal foliage-like structures. Although the plant often remains in this condition for some time, fruit formation rarely occurs.

Yellow crinkle usually makes its appearance during the late summer. The disease is commonly restricted to scattered individuals, but as high as a 25 per cent. infection has been recorded. It is apparently more serious following a period of drought.

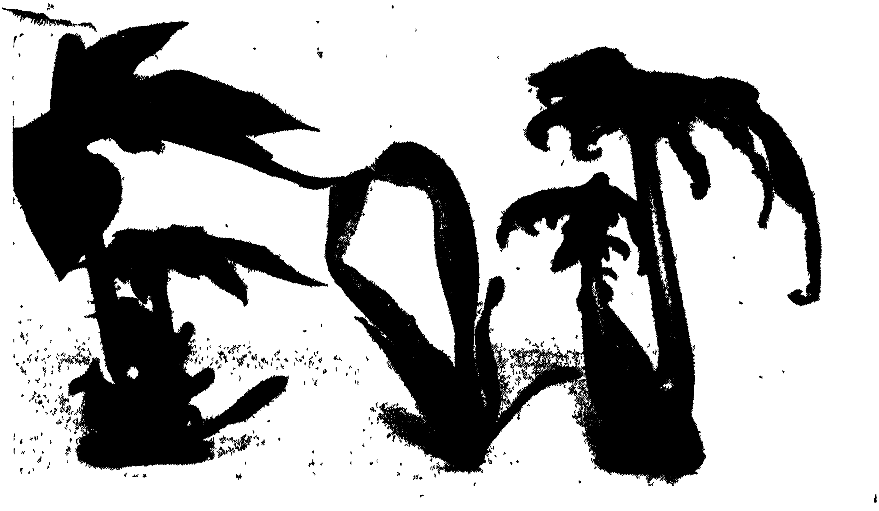

Plate 227.

YELLOW CRINKLE OF THE PAPAW.—A. Portion of the crown of a healthy plant for comparison. B. Abnormal development of a flower. C. Yellow crinkle symptoms in the crown leaves of a diseased plant Note the broken margin and incurved end of the segments.

The exact cause of yellow crinkle has not been proved definitely, but its characteristics suggest that it may be due to an infectious virus, as is the case with bunchy top of the banana. This type of disease is usually spread by transferring sap, in which the virus is present, from a diseased to a healthy individual. In the present case it does not appear possible to effect a mechanical inoculation by means of the hands or implements, and it is likely that certain sucking insects are implicated in the spread of the disease. Normally, very few insects of any description are to be found on the papaw, which may account for the fact that yellow crinkle is sporadic in its appearance.

Control.

From the point of view of control it would be wise to assume, as the evidence suggests, that this disease is of a virus nature. If this be so, it is useless to expect a cure, and it becomes necessary to eliminate the source of the virus by digging out any affected plant as soon as it is noticed. The crown of the plant should be sprayed before removal with kerosene or strong nicotine sulphate solution to kill any infective insects present. Although it is not uncommon for one crown of a branched tree to be affected first, it is unwise to destroy only this one, as the disease usually appears later in the remainder.

DIEBACK.

A papaw tree affected with dieback exhibits a general yellowing of the leaves accompanied by the death of a few of the younger ones, either completely or in segments only. The dark shrivelled areas on these centre leaves may continue down the petiole to a dark brown rather dry area of decay at the tip of the stem. This dead area on the stem does not usually extend for more than a few square inches and, unlike the lesion caused by black spot, is fairly shallow and apparently unoccupied by any parasitic organism. Eventually, all the leaves wither and die, and any fruit present ripens abnormally or else softens and falls off green. A tree with several branches may have one or more branches die.

This trouble affects both young and old trees and those in vigorous as well as in poor condition. It is most prevalent during protracted dry spells, and appears to be more immediately related to periods of hot, drying winds. Nematodes and a root rot from which *Phythium ultimum* has been isolated may accompany the dying of the tops, but not consistently.

It is for the present considered that this disease is a physiological trouble somewhat akin to blossom end rot of tomatoes. During a dry season, when soil moisture is low, and especially if the efficiency of the roots is depleted by the presence of nematodes or decay, a period of hot, drying weather will cause the plant to transpire from its leaf and fruit surface more moisture than the roots can immediately replace. The deficiency may be partly made up by drawing on the supply in the soft, sappy tissue of the stem apex and young leaves. If the drain is too great these parts will collapse and eventually die.

A partial root rot, following excessive rain, by producing artificial drought conditions, has also given rise to similar symptoms.

Control.

Where possible, careful irrigation so that the soil does not become too wet or too dry should minimise loss from this trouble.

In many cases an affected plant will send out healthy lateral shoots from farther down the stem. If, therefore, the dead top is cut off at one of the stem partitions, a new fruiting stem will often be formed to replace it as soon as growing conditions improve.

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FOWL MANURE.

Poultry are usually fed a ration rich in protein, and consequently their excrement is rich in nitrogen. The arrangement by which intestinal and kidney waste products are voided together makes the nitrogenous products of fowl manure largely soluble.

It follows that care must be taken in storing fowl manure to see that no loss by leaching occurs. This may be done by storing it under cover in peaked heaps, or by mixing it with sand or friable earth which will absorb the soluble plant food.

Its high nitrogen content makes fowl manure a forcing fertilizer—usually termed "strong"—so that while its use for rapidly growing vegetables and strawberries is advocated, admixture with superphosphate and potash is advisable for most other crops.

Insect and Allied Pests of the Papaw.

J. HAROLD SMITH, M.Sc., N.D.A.

THE papaw is subject to a fairly wide range of pests, all parts of the plant being attacked. Some, such as the red spider, can be expected in most districts every year; others, such as the fruit-spotting bug, are only troublesome occasionally. Only the more important pests are discussed here.

THE RED SPIDER.

The red spider* is a mite known to attack a variety of hosts. The name is rather misleading, for the colour is seldom red, greyish green being dominant, although the actual shade varies greatly even within a single colony.

The leaves of affected plants show symptoms comparable with dry weather effects; the margins curl, the colour is bleached, particularly near the main veins, and reddish brown blotches may appear in the final stages of an attack. Normally, infestation commences in the older leaves, and then spreads to the younger growth. These symptoms are the result of mass feeding by very large numbers of mites on the under surface of the leaves. The fruits may also be infested, but this type of injury is of slight importance compared with the impoverishment associated with extensive leaf injury.

When infested leaves are closely examined, all stages of the mite from the microscopic egg to the very minute adult can be observed on the under surface. Silken threads are spun by the adult, and illustrate a characteristic habit of this and some related species, from which they have acquired the name "spinning mites."

Growth is very rapid, particularly in summer, when the period between egg and adult is approximately only a fortnight. Because of its high reproductive rate, an attack may develop very quickly. Red spider outbreaks are, however, usually sporadic, acute one month and negligible the next, but a whole season's growth may nevertheless be disturbed by a single attack. These marked fluctuations in the red spider populations are usually attributed to the mite's sensitivity to climatic changes, warm dry weather being favourable for a rapid increase, while cold temperatures with or without heavy rain retard development. In coastal Queensland, red spider infestation is frequently worst in spring when the weather is relatively dry with comparatively warm days.

Although predators are frequently active on red spider infested plants, they cannot be relied upon to keep the pest in check, and control measures are often necessary. Fortunately, the red spider is by no means difficult to control, and either a lime sulphur spray or a sulphur dust can be used. Lime sulphur is, perhaps, the more effective, and as the spray gives good control of powdery mildew this treatment is frequently preferred. Although a lime sulphur spray can be used at a concentration of 1 in 35 during winter and early spring, weaker solutions will be necessary in warmer weather if injury to the plant is to be avoided. For large-scale work, particularly in hilly country, the sulphur dust is more easily applied, and where mite control is the main objective reasonably good results are achieved. No matter which treatment be adopted, thoroughness in application is essential, and particular attention should be paid to the under surface of the leaves, where the pest is most numerous. If the mites are plentiful, some may survive a single spray or dust application. More than one treatment may then be necessary to give adequate control.

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* *Tetranychus telarius* L.

PAPAW BUGS.

A number of bugs are partial to the papaw, the two chief being the fruit-spotting bug* and the green vegetable bug.† The former is the more spectacular in its effects; the latter is more commonly encountered.

The fruit-spotting bug (the common name describes typical injury in banana fruits) is most troublesome in the Central district, where it achieved notoriety some years ago as a pest of bananas. The injury to papaws is seldom acute elsewhere. The actual damage caused by a comparatively small fruit-spotting bug population is sometimes considerable. The young growing point is attacked and cracks appear in both the leaf stalks and the main stem; fruit may develop black sunken spots where they have been pierced, and there is frequently a characteristic after-effect in which the young growth is stunted and crinkled. The check to the plant may be serious, particularly if growing conditions do not favour a rapid recovery.

The green vegetable bug attacks numerous hosts other than the papaw, for which it shows no special preference. The pest is frequently abundant in summer, and papaws may suffer, both the young growth and the fruits being attacked. In the latter case, a lesion appears where the fruit has been pierced, and produces a "marbled" appearance, which is reflected in the uneven texture of the edible flesh. As in the case of the fruit-spotting bug, an attack on the terminal growth produces distinct though noticeably less serious abnormalities.

Control of these pests by insecticides has not, as yet, proved practicable, and the grower must, when necessary, resort to handpicking.

THE YELLOW PEACH MOTH.

Growers are more familiar with the damage caused by the yellow peach moth‡ than with the insect itself. Papaws frequently suffer at least some dieback due to larval infestation at the growing point. Not all dieback is attributable to the pest, but when conditions are otherwise favourable for the plant and dieback still occurs, this pest can be suspected. The larvæ may also infest the fruit, penetrating the flesh particularly where adjacent fruits are in contact with each other. A similar type of injury to peach and citrus fruits is not uncommon in some districts.

The adult moths possess a wing span of approximately one inch, and the wings are yellow or orange with numerous black spots. Eggs are laid singly, and the larvæ when hatched soon commence to burrow into the fruit or growing point, as the case may be. When full fed, the larvæ pupate in a loose webbing among dry fragmented leaves or similar organic matter.

The habits of the insect are such that no control measures can be relied on to ease the position in the papaw grove. In the event of dieback from yellow peach moth, the grower has no option but to foster one or more of the lateral shoots which develop, treating these as the bearing arms of the plant. In practice, it is advisable to cut off the damaged head from the plant and place a suitably sized tin over the cut surface to protect the stump from excessive decay.

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* *Amblypelta lutescens* Dist.

† *Nezara viridula* L.

‡ *Dichocrocis punctiferalis* Gn.

NEMATODES.

The papaw is particularly susceptible to eelworm or nematode* attacks. The symptoms correspond with those in other hosts (Plate 228; figs. 2 and 3), and typically consist of malformed swollen roots—hence the colloquial term "knotty root." Although heavily infested the roots may still function to some extent, but the cumulative effect of an attack extending over many months, or even years, is such that the plant is starved for essential nutrients. Above ground the effect is apparent in the sluggish development of new spring growth, a lack of colour in the leaves, and undersized slowly maturing fruit. Ultimately the plant ceases to be profitable to the farmer.

Nematodes appear to thrive in the lighter types of soil, and as many papaw groves are located on precisely this kind of soil, nematode-free plants are the exception rather than the rule.

Nematodes are very minute eelworms which attack a large range of cultivated plants. The reproduction rate of this pest is very high. When the young hatch from the eggs (Plate 228; fig. 5) they move through the soil until they find the roots of a suitable host plant, which are then entered through incisions made by the needle-shaped mouth parts. Growth occurs within the the plant tissues, and "knots" or galls develop in the roots. When these galls are cut the small glassy pear-shaped female (Plate 228; fig. 7) can sometimes be seen embedded in the tissue. Several generations are possible in a year, and the build-up in the nematode population in soil carrying a suitable host is very rapid.

Control presents serious difficulties, and reasonable protection is the most that can be expected in practice. Natural movement of the eelworm through the soil is comparatively slow, and when high populations occur in relatively new land it is reasonable to suppose that the pest has been introduced with nursery stock or by dirty implements used previously in infested soil. It is therefore sound practice to clean the soil from implements which are being transferred to the papaw grove from infested truck crop areas. For the same reason, it is preferable to grow the seedlings in the grove rather than in an infested nursery from which they must later be transplanted. Alternatively, seedlings may be grown in ground which has not previously grown plants susceptible to nematode attack.

Although most crops are attacked, there are a few immune, or at least resistant, crops, which include many grasses, some cereals—e.g., wheat, barley, maize—and several varieties of cowpea. The use of such crops in conjunction with fallowing is very helpful in conditioning nematode infested land for papaws. A year or two's preparation in this way is by no means a waste of money; the crops themselves are of some value, and, most important of all, the papaws, when planted, get a good start, and may then crop profitably for a reasonable period in spite of nematodes.

For the same reason, papaws should never follow other nematode-susceptible crops, such as tomatoes and potatoes, in the rotation. If soil-conditioning is not practicable, the grove should be established on new ground or, failing this, the least infested ground on the property.

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* *Heterodera marioni* Goodey.

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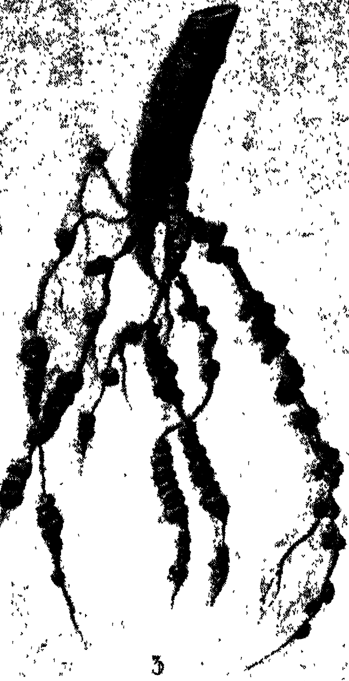

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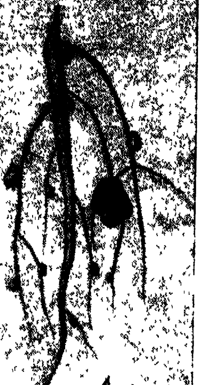

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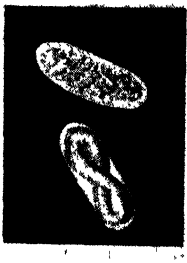

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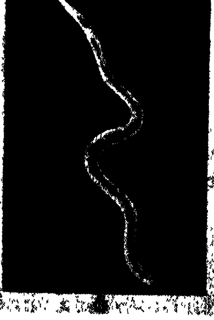

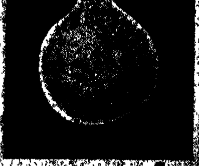

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Plate 228.

Papaw failure due to nematodes is primarily a sequel to direct starvation following root injury, the vigour of the plant being proportional to its feeding capabilities. Liberal cultural and manurial treatment increase the efficiency of existing roots, while the plant tends, under such treatment, to throw out further lateral roots above the already injured tissues. The bearing life of the plant may be prolonged for a year or so in this way.

Careful attention to the isolation of the grove from outside contamination, conditioning the land with immune or resistant crops before planting, the selection of new ground when practicable, and adequate cultural and manurial treatment should therefore ensure a reasonably long bearing period.

OTHER PESTS.

Other pests of the papaw which may attract the grower's notice are fruit flies, fruit-sucking moths, and jassids.

Although authentic cases of papaw infestation by the Queensland fruit fly* are known, there is frequently some confusion in the grower's mind between this pest and scavenging species associated with fungal rots on the fruit. When the papaw is attacked by fruit fly, the injury is much the same as that in other commercial fruits, the edible flesh being destroyed by larvæ developing from eggs laid by the female in the fruit. Control measures are rarely necessary, but presumably the standard recommendations for this pest requiring the destruction of infested fruit and systematic luring with a vanilla-ammonia solution would diminish the losses.

Fruit-sucking moths† are primarily seasonal, and attack a variety of maturing fruits during summer and autumn. A number of species are usually associated with any one outbreak, and the fruit losses are sometimes considerable. Control recommendations in other countries require the use of poison baits, but these have so far proved valueless here. Reasonable protection can be obtained by inspecting the plants at night by means of a torch. The moths are then feeding, and can be easily caught by hand and destroyed. Systematic attention may be necessary for some weeks, but the work is well worth while when a maturing crop is at stake.

Jassids‡ are small agile hoppers which occasionally attack papaws in some parts of the State. When numerous they seriously affect the vitality of the plant, for partial or complete leaf failure may reduce the capacity of the plant to bear and mature good fruit. Adequate control measures are not available. Nicotine dusts certainly kill some of the immature stages, but the necessary expenditure is seldom justified in practice.

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* *Chætodacus tryoni* Frogg.

† *Othreis fullonica* L. and *Eumænas salaminia* F. principally.

‡ Jassidæ.

DESCRIPTION OF PLATE 228.

Root Knot Nematode.—**Fig. 1—Nematode-infested potato tuber. Fig. 2—Nematode galls on strawberry roots. Fig. 3—Nematode galls on tomato roots. Fig. 4—Bacterial nodules on lupin roots. Fig. 5—Nematode eggs x 150. Fig. 6—Larval nematode x 150. Fig. 7—Adult female nematode x 30. Figs. 1 to 4 half natural size.**

Tobacco Seedling Production in North Queensland.

R. C. CANNON B.Sc.Agr., Instructor in Agriculture.

IT is generally recognised that the production of healthy, vigorous seedlings is of paramount importance to the tobacco grower. Given satisfactory growing conditions, such seedlings will make good growth and result in an even stand of uniformly maturing tobacco in the field. Such plants are also better fitted than weakly seedlings to withstand adverse weather conditions and the ravages of the numerous pests and diseases to which the crop is subject.

Selection of Site.

The land selected for the seedbeds should be well drained and protected as much as possible from strong winds, which dry out the soil and are prone to damage the protective coverings of the beds. The seedbeds should not be located, however, in low-lying, cold, or shady situations conducive to disease development. Loamy soils are admirably suited to seedling production, though in most cases the grower is forced to make use of a more sandy type of soil. The texture of the soil may be improved by ploughing under green manures or by the addition of suitable organic matter from other sources. All other considerations apart, it is most desirable that the seedbed area should be located conveniently with respect to the water supply. The regular attention required also demands that it be situated as close as practicable to the dwelling. It is inadvisable to attempt to grow seedlings continuously on the one area of land on account of the possible accumulation of spores of disease organisms. For preference, a system of seedbed rotation should be evolved to overcome this difficulty.

Area Required.

The extent of the seedbeds required will be governed by the area it is proposed to plant in the field; it is usual to regard 100 square feet as adequate to plant out 1 acre. Old seedlings cannot be expected to make the same growth in the field as young ones, and in order to obtain a good stand in the field it is essential that the seedlings be young and vigorous. As it is impossible to accurately forecast weather conditions, it will be obvious that the objective can only be attained by laying down a series of beds at regular intervals to provide suitable seedlings for planting when appropriate weather conditions are experienced. This means a larger seedbed area, with slightly increased costs, but the added security provided would to a large extent offset the additional costs.

Preparation of Beds.

With such minute seed as that of tobacco, it is essential to have a bed of very fine tilth, and the need for thorough cultivation cannot be stressed too much. The land should receive several cultivations before being made up into beds.

The next operation is the sterilization of the soil, which serves a dual purpose—namely, the destruction of harmful organisms in the soil as well as weed and grass seeds. The cheapest and most general sterilizing agent is heat; for this purpose brushwood or the organic material from certain antbeds may be used. Very good results have been obtained with the latter, which is easy to collect and handle, and produces a steady, even heat. The whole area of the seedbeds, inclusive of pathways, should be covered; in the case of wood, a layer about 9 inches deep should be used, or where antbed is employed a layer 3 to 4 inches thick should be sufficient. Following the burn, all unburnt fragments should be carefully raked off before the whole bed is dug over to thoroughly incorporate the residual ash. At this stage it will be found convenient to erect the framework, the design of which will be determined by the methods to be adopted as a protection against diseases and pests.

Framework.

In the hot, dry climate of the tobacco-growing areas of North Queensland, unprotected seedbeds rapidly dry out, and the young seedlings are liable to be scorched by the direct rays of the sun. Therefore, it is necessary to make provision for the shading of the young seedlings during the day, and also to protect them from the inroads of insects. A suitable framework will not only maintain the beds in good shape, but will also provide a base for the erection of covers. For this purpose the most satisfactory material is sawn timber, which is easy to erect and gives a neat finish which assists in making the beds moth-proof. Many attempts have been made to utilise cheaper materials, but none are quite as effective as sawn timber, which will last well if treated with care. Boards 6 inches wide are well suited for the sides of the seedbeds.

The maximum length of the seedbed for ease of manipulation is about 50 feet, while the width will be determined by that of the covering material to be used, the usual width of beds being from 3 to 4 feet. The most convenient framework has three straining posts at each end to carry the wires which support the covers. The centre post should be high enough to hold a central wire about 15 inches above the ground. The side posts need not be so long, and are placed a few inches in from the edges to carry wires about 9 inches above the level of the bed.

Final Preparation and Fertilization.

As a rule, tobacco seedbeds are of necessity situated on poor, sandy soils deficient in organic matter If possible, the humus content of these soils should be increased by the application of horse or goat manure or some other suitable organic matter used in moderation. This should be previously sterilized by boiling to destroy any harmful organisms which may be present, as well as the weed seeds, which are inevitable. Where such organic matter is added, the application should be made at least two weeks prior to the sowing of the seed. A dressing of such organic manures will improve the texture of the soil, as well as its capacity for retaining moisture and plant foods. Plants grown in good textured soils are enabled to produce well-developed root systems, which materially assist in their establishment in the field.

The general practice is to apply a dressing of an ordinary fertilizer mixture, such as 4 : 12 : 6, before sowing the seed. An alternative procedure is to apply superphosphate at the rate of 1 oz. per square yard and nitrate of soda at the rate of ½ oz. per square yard. It is not considered necessary to include potash in this mixture, since sufficient potash is added to the soil in wood ashes when the beds are sterilised by burning. The superphosphate and nitrate of soda may be applied separately or else thoroughly mixed just before application. In all cases the fertilizers should be thoroughly incorporated in the soil at least one week prior to sowing. While the beds are still in the rough, it may be of advantage to apply sufficient water to ensure a good moisture content in the soil. It is most important that the soil be well dug and raked over to break down any coarse soil particles before proceeding to sow the seed.

If desired, as an added precaution against damping-off, the beds may be watered over with Cheshunt mixture a day or so before planting. The preparation and method of application of Cheshunt mixture is described at the end of this article.

Sowing the Seed.

The seed should not be sown too thickly, otherwise soft, spindly plants are likely to result. It has been found that a rate of two-thirds of a teaspoonful of seed per 100 square feet of bed is ample for the purpose. The usual method adopted for sowing tobacco seed is to mix it with fine sand or ashes, and then distribute the mixture as evenly as possible over the surface of the bed by hand or by means of a home-made shaker. This should be done at a time when there is no wind, otherwise the distribution will not be even. Another method is to apply the seed in water through an ordinary watering-can—a method which has the advantage of being more or less unaffected by windy conditions. A can is half-filled with water, and the requisite quantity of seed added and well stirred before the rest of the water is added to nearly fill the can. The seed will remain in suspension for some time, but the can should not be allowed to stand for any length of time without being again stirred before sowing. Some growers favour the addition of a fine layer of loamy soil to cover the seed, but it must be remembered that the seed should not be deeply covered. As soon as convenient, the soil should be tamped down with a flat board to establish contact between the seed and the soil particles. In many districts it has been found necessary to apply a light mulch of medium grade river sand ⅛ inch in thickness to protect the seed from the ravages of seed-harvesting ants. In any case, this mulch possesses the added advantage of appreciably reducing the evaporation of moisture, and is to be recommeded irrespective of the prevalence of ants. Should leaf-cutting ants make their appearance, they can be dealt with by broadcasting fine maizemeal over the seedbeds when the seed is germinating.

Covering of Beds.

As protection against the sun and insects, a number of materials have been used—e.g., hessian, stockinette, cheese-cloth, Rhodesian cloth, duck, and calico. When using hessian care must be taken to ensure that the plants receive sufficient sun, otherwise soft seedlings are apt to result. A very effective cover may be made from Rhodesian cloth, which is a specially reinforced cheese-cloth. It has the advantage of permitting the entry of abundant light and air, both of which are so necessary to the growth of good, hardy seedlings. Covers of Rhodesian cloth can be kept in position from 5 p.m. to 10 a.m. without adversely affecting the seedlings, and if retained in position during these hours they will prevent the moths of the stem borer and leaf miner, which do not fly by day, from gaining access to the seedlings for egg-laying purposes. Recently the use of benzol vapour against blue mould has come into prominence, and this calls for materials of better quality, which must be more or less gastight. When suitable calico or duck covers are used in conjunction with benzol vapour, they must be removed early in the day, so that the plants may receive the benefit of the early morning sun. Even so, leaf miner and stem borer infestation may be somewhat reduced by the presence of these covers. Whatever covering material is chosen, it still remains necessary to harden off the seedlings a week or so before planting out.

As mentioned previously, it is usual to have three wires running the length of the beds to support the covers. Quite a number of methods are employed to attach the covers so as to facilitate removal for watering, spraying, and sunning, but space will not permit of detailed descriptions.

Care of the Beds.

The vital stage in seedling production occurs during the early period of growth, when the plants are small and possess a poorly developed root system. At this stage the beds should never be allowed to dry out, and abundant, though not excessive, water should be supplied. The amount required and the frequency of waterings will depend on weather conditions; under dry conditions it may be necessary to water as often as three times a day during the first few weeks. As the plants grow, and the root system extends, watering may be reduced to once daily. From the time of germination onwards it is necessary to protect the young seedlings with the covers at least during the hot periods of the day.

Seedlings should always maintain a vigorous growth, and should there appear to be any serious retardation of growth at any time, the application of a solution of nitrate of soda in water at the rate of ½ to 1 oz. per 4 gallons of water will in most instances sufficiently accelerate growth. On the other hand, it is inadvisable to apply nitrogenous manures too liberally, or there is likely to be a tendency towards soft seedlings, which will be difficult to harden off.

Hardening off should be a gradual, rather than a sudden, process, and the plants should be allowed an increasing amount of sunlight in the mornings and afternoons until they can stand the full sun during the whole day without serious wilting. The tendency of some growers to overdo this and seriously retard growth is to be deplored. It is much preferable to have another series of beds in case planting is delayed. Vigorous, hardened seedlings are able to make a rapid recovery from the shock of transplantation and to make quick growth in the field.

Protection Against Diseases.

One of the most serious diseases encountered in tobacco seedbeds is blue mould, in the development of which, over-watering of beds is often a predisposing factor. In the past good results have been obtained in North Queensland with a colloidal copper spray. Gas treatment has proved most effective during the past two seasons, though the costs are much higher. Colloidal copper also offers protection against frog-eye leafspot, whereas benzol apparently does not, and if the latter is used it is strongly recommended that the seedlings be sprayed at least once a week with the colloidal copper spray in addition. This spray will also afford some measure of protection against infestation by the leaf miner and stem borer.

Satisfactory results may usually be obtained by regular spraying with colloidal copper twice a week. The object is to maintain a thin protective film on the under-surface of the leaves, and where the plants are making very rapid growth, or where there is a likelihood of the spray having been washed off by rain, it may be necessary to increase the frequency of treatment. It is most essential that the under-surface of the leaves be well covered, otherwise the spray will be ineffective. When the plants are very small a fine spray over the whole area will be adequate, but as soon as they are large enough to stand greater force a flat spray should be used. The beds should be sprayed from both sides with the rod held nearly horizontal so as to turn back the leaves and ensure complete covering. Very satisfactory results have been obtained with a bucket-pump and spray.

Home-made colloidal copper spray may be prepared as follows:—Dissolve 1 lb. of bluestone fines in 2 quarts of water in a non-metallic vessel, then stir in 1 pint of molasses, and make the solution slightly alkaline by the addition of caustic soda solution. For this purpose 5 oz. of caustic soda are dissolved in 1 quart of water, and gradually added to the bluestone and molasses mixture with constant stirring. Sufficient of this solution must be added so that litmus paper will not be affected—i.e., red paper does not turn blue nor blue paper red. Usually the mixture will thicken just before this point is reached. For spraying, this stock solution is diluted as follows:—

(i.) Stock solution, 1 quart in 7 gallons of water; to this add
(ii.) Potash soft soap, 6 oz. dissolved in ½ gallon of water.

These quantities will make up about 8 gallons of spray. It will be found convenient to make up as large a quantity of the stock solution as can be stored, since it will not deteriorate with storage, but rather improve. On the other hand, it is inadvisable to keep the stock solution over from one season to the next.

Gas treatment with benzol has proved more effective in controlling blue mould in seedbeds than colloidal copper, and was used on a commercial scale during the past season. The initial experiments carried out in the Southern States indicated a higher concentration of vapour than has been found necessary in North Queensland, where an evaporating surface of 1 square inch per square foot of seedbed has been found to be ample. The first essential is to have the beds as nearly gastight as possible, a condition which is fulfilled by good quality calico or duck without any further treatment. It is advisable, however, to protect the material from the growth of moulds, which darken it and reduce its effective life. For this purpose alum-lead acetate has proved satisfactory, and its preparation and use is outlined hereunder:—

Dissolve 1 lb. of alum in 1 gallon of boiling water with stirring, then add this to 4 gallons of cold water. Soak the cloth in this solution for twenty-four hours, and make sure that it is thoroughly wetted throughout. Then wring lightly before transferring to a solution prepared by dissolving ¾ lb. of lead acetate in 1 gallon of boiling water with stirring, to which is subsequently added 4 gallons of cold water. Soak the material in this solution for five or six hours, and then wring out and allow to dry.

A proprietary product kown as Shirlan AG also has been found satisfactory for this purpose, and has the advantage of being easily prepared. A suspension is made up by stirring ½ lb. in 5 gallons of water, and the cloth is immersed in it, and kneaded well, for half an hour.

To prevent leakage of vapour from the beds the edges should have a neat, smooth finish, and ends should be made of timber. It has been found quite convenient to use the usual tent-shaped beds for benzol treatment. The benzol is exposed in shallow tins about 4 inches square and about 1½ inches deep. These tins should not rest on the ground, but can be placed on suitable short stands made of wood or wire. There should be sufficient of these to provide 1 square inch of evaporating surface to every square foot of bed, and they should be evenly spaced along the length of the bed. The benzol is exposed in these tins during the night from, say, 5 p.m. or 6 p.m. to 7 a.m. Experiments carried out in the Dimbulah district during the past season showed the consumption of benzol to be about 2 fluid oz. per 100 square feet per hour—that is, a little over 1¼ pint per 100 square feet per night. Any benzol remaining in the tins when the beds are opened in the morning should be collected and stored for future use. The beds should be opened to allow free passage of air, which will remove any vapour and so prevent damage to the seedlings when the sun is hot.

As previously mentioned, it is advisable to spray in addition such seedlings at least once a week as a protection against frog-eye leafspot as well as leaf miner and stem borer.

Should damping-off develop at any time, prompt application of Cheshunt mixture will usually check its spread. To prepare this mixture grind up some copper sulphate (bluestone) and some ammonium carbonate (rock ammonia) separately, and then thoroughly mix them in the proportions of two parts of copper sulphate to eleven of ammonium carbonate, and store in a well-stoppered bottle at least twenty-four hours before using. The powder is dissolved in water at the rate of 1 oz. per 2 gallons of water, and the solution is then applied with a watering can, which should be well rinsed after use to prevent corrosion.

At all times the beds should be carefully observed in order that remedial measures may be instituted immediately any disease symptoms are apparent. Strict attention to seedbed sanitation will have the effect of greatly reducing the liability to losses from diseases and pests. Should webworms or leaf-eating caterpillars become numerous in the seedbeds in spite of the adoption of the measures recommended in the preceeding paragraphs, it will be necessary to dust the seedlings twice weekly with a 50 to 75 per cent. arsenate of lead dust to obtain control.

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DESTRUCTION OF OLD TOBACCO PLANTS.

The practicability of checking the ravages of various pests and diseases will determine in a very large measure the degree of success achieved in growing tobacco. The leaf miner and stem borer constitute a very serious menace to the crop, and it is essential that the populations of these two insects carrying over from the old crop to the new one should be reduced to a minimum.

Much can be accomplished by the elimination of breeding grounds during the months intervening between successive crops of tobacco, because in some of the more important tobacco districts practically nothing but tobacco is grown. Hence, if tobacco plants are uprooted and destroyed by fire as soon as possible after the completion of the harvesting of the leaf, and if volunteer plants are similarly dealt with, the new crop should get a good start free from any serious infestation. The position will be improved still further if the destruction of these tobacco plants is accompanied by the elimination of several leaf miner weed host plants, which occur in the main tobacco districts, and are closely allied botanically to tobacco. Again, from the point of view of insect control, the production of two tobacco crops in twelve months is fraught with great danger, at least in so far as the incidence of leaf miner and stem borer is concerned, and should be avoided on that account.

The procedure just recommended, of course, will help materially to reduce the carry-over of tobacco diseases. Growers are advised not to burn old tobacco stalks on the site of a new seed-bed.

Inconspicuous Organisms which Aid the Growth of Plants.

H. E. YOUNG, M.Sc.Agr., Assistant Research Officer.

OF recent years the importance of various fungi which are found in association with the roots of plants has been realised, and a considerable amount of research into the nature of the relationship carried out. Different species of fungi are found with many different groups of plants. The first plants to receive attention were the orchids. In these it has been found that the seeds will not germinate naturally without the presence of a particular fungus.

In the case of the orchids, the fungus after germination enters the roots of the seedling and lives there in the root tissue, sending out fine threads to the exterior, where they come into contact with the bark or leaf mould, &c., on which the plant is growing. The fungus is able to break down the insoluble organic matter in the dead bark and leaves into compounds which are available to the plant. The plant then absorbs the greater proportion of its ration of these substances through the roots, and some probably finds its way along the threads into the plant cells where the plant, under normal circumstances, is continually digesting the fungus structure after it reaches certain stages of development. By these means the hitherto unavailable but essential foods in the raw organic matter are rendered usable for the orchid plant.

Of course, if the seed lodges where one of these fungi is not present, in the first place it will not germinate, and in the second place if it did certain forms of organic matter would be unavailable to the growing plant. The germination effect is brought about by the fungus causing a rise in the concentration of sugars and also adjusting the acidity of the substratum. Germination can now be caused in test tubes by artificially supplying these conditions without the presence of a fungus.

After the discovery of the importance of fungi to orchids other plants were examined for similar effects and it was found that nearly all plants growing on peat soils, such as the heaths, had these fungus associations. Following this, similar structures were found on the roots of many forest trees, particularly conifers, and the list of plants with these associations is growing rapidly.

The failure to grow pine trees successfully in many nurseries was then found to be due to the absence of the particular fungi which are normally associated with the pines, and vigorous growth was produced by inoculating the nursery soils with these fungi. This is easily done by getting a small quantity of soil from beneath a vigorously-growing tree and placing it, with its contained fungi, in the nursery beds. The trees then, instead of being small, yellow and stunted and gradually dying out, become green and grow vigorously. This was found to be the case in several nurseries in Queensland and has been found in numerous cases overseas and in other States. The Queensland native hoop pine could not be successfully reared in Nyassaland until the nursery soil was inoculated with material from beneath a vigorous hoop pine tree.

In the case of trees, the fungus is found on the roots in various types of structures (Plate 229) know as mycorhiza, the type appearing to depend on the soil conditions, the species of tree, and the species of

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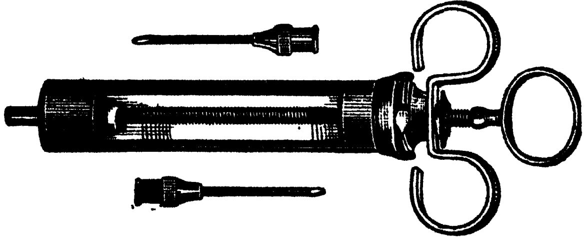

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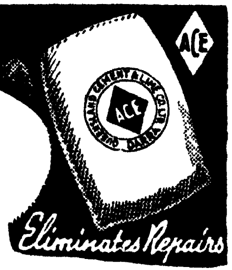
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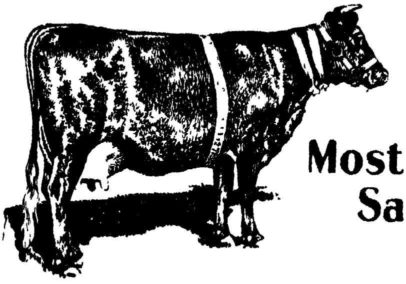

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fungus. In soils which have a low content of raw organic matter the fungi come to act as parasites, when the structures are called pseudo-mycorhiza. This is in direct contrast to the assistance they render when the supply is adequate.

Plate 229.

Mycorhiza and fungus fruiting body on roots of a pine tree.

In the normal beneficent type, the fungus threads branch out from the mycorhiza, which are situated on the feeding roots in the surface layers of the soil, and penetrate the soil in all directions and appear to represent a very much extended root hair system. They spread much further and come into contact with many more soil particles than do root hairs, which disappear from fungus-infected roots. These fungi in the soil act in the same manner as do those in association with orchids. They make available the products of raw organic matter in the soil which the plant is unable to use before the fungus action, and without which poor growth is usually produced. The fungi probably have a second role in the soil by carrying mineral salts in a dissolved state along the fungal threads to the roots.

Poor growth in a soil does not necessarily mean that the fungus is absent, but may indicate that a sufficient supply of raw organic matter is not present and should be supplied for the fungus to work on. In fact, one worker in England has shown that with forest trees one can tell the state of the organic supply of the soil by microscopic examination of the mycorhiza on the root of the plant growing in it when once the normal structure for that species has been found for comparison. There have been cases reported also of harmful fungi forming pseudo-mycorhiza with roots and causing poor growth in plants.

Mycorhiza have been reported as being present on citrus and have been observed on the few trees examined in Queensland. Members of the Pasteur Institute have carried out researches on citrus mycorhiza in California, and from their work, and that of others, it would appear likely that poor or contradictory results obtained after the application of fertilizers to citrus trees may be explained by taking mycorhiza into consideration. Ample supplies of all the essential mineral salts are, probably, in the case of mycorhizal trees, of little value without the presence of sufficient raw organic matter for the mycorhizal fungi to work on; consequently, mulching might be of value in these cases.

In the case of a disease in pecan trees known as pecan rosette, it has been found that the treatment of affected trees with zinc alleviates the trouble. One investigator of this problem considers that the presence of zinc is essential in the pecan tree in order that it may maintain a correct balance with its mycorhizal fungus. The fungus, according to this theory, apparently becomes antagonistic towards the tree when there is an insufficient supply of available zinc. It has also been suggested that mottle leaf of citrus may be due to the same cause.

Mycorhiza have been reported from strawberries and many species of fruit trees and grasses. Australia's eucalypts, even, possess mycorhiza. Work is being carried out in France on the mycorhiza of the potato, and from reports it appears likely that the results will be of considerable economic value. Research on mycorhizal problems is really only beginning, and exacting work will have to be done with the various plants before the complete picture of the fungus-plant association is made clear. Experiments in the study of the physiology and nutrition of the fungus will have to be done, and research concerning the effect of different fungus species on the nutrition of particular plants will have to be carried out. So far, the study of the mycorhiza of forest trees is, in general, in advance of that of other crop plants, but if the results at present being obtained experimentally with species of pine, particularly in England, are any criterion of what may happen with other plants, some important results are likely to be obtained from a closer study of this little-known problem.

Sown Pastures and Their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Research Officer.

(PART V.)

[*Continued from p. 429, Part 4, Vol. XLVIII.—October,* 1937.]

SELF-REGENERATING SUMMER PASTURE LEGUMES.

Lespedeza (*Lespedeza striata* Hook. et Arn.).

Origin and Distribution.—The common lespedeza is a native of the Orient which has been cultivated for many years in the Southern United States of America for hay, pasturage and soil improvement purposes. It was introduced to Queensland over thirty years ago and has spread to some extent in the coastal strip south of Gympie. No systematic use of the legume has yet been made in Queensland, but there would appear to be a future for it if properly utilised.

Description.—Lespedeza is a somewhat bushy plant reaching a height of about 18 inches when growing under favourable conditions. The branches in the lower portion of the plant are almost horizontal and individual plants may be as much as 3 feet in diameter. Small leaves are borne in profusion along the stems and are distinctly veined. The small rose-coloured flowers occur singly in the axils of the leaves in all parts of the plant.

Climatic Requirements.—Common lespedeza is a summer-growing annual which makes its development between October and March and goes to seed prior to dying off in April. Because of its long growing season it is of more use in the sub-tropics than in temperate areas, and for the same reason might be expected to have a limited sphere of usefulness in areas in which the wet season commences late in the summer. The plant is moderately susceptible to frost injury and late frosts may kill early-planted lots and destroy late sowings before seed is set.

Soils.—An important feature of lespedeza is its ability to thrive on soils too acid to permit of the development of the common clovers (white, red, &c.) and lucerne. Since most of our coastal dairying and grazing country is somewhat acid in nature this is an important characteristic. On the most sour soils liming would be necessary. The range of soil types on which lespedeza can be grown is large, and one of its main uses is for the improvement of poor, worn soils.

Planting.—Lespedeza is used both for pasture and for hay, and seeding practices vary accordingly. For pasture purposes, the legume can be sown alone, in admixture with other pasture seeds or on already established pastures. When sown alone on well-prepared land about 15 lb. of seed per acre should produce a good stand. Sown with paspalum or Rhodes grass seed, 4 lb. per acre would suffice to start the legume. Broadcasting 4 lb. per acre on ploughed or disced native pasture or paspalum pasture would ensure a good foundation for the spread of the plant. Quite commonly in the United States, lespedeza is broadcasted in the early spring on top of crops of wheat, oats or other cereals and slightly covered by harrowing. Spring or early summer sowing is desirable.

Management.—Since lespedeza is an annual which regenerates itself each year from self-sown seed that germinates in the spring, the early summer grazing of pastures containing this legume must not be heavy, otherwise the seedlings might be destroyed. Once the plants have become established, the pastures may be grazed heavily at intervals, but towards the end of the season the legume must be permitted to ripen seed, if it is to carry itself on and spread. The use of superphosphate may prove beneficial to the plant.

Conservation.—Lespedeza is said to make a good class of hay, but, so far as is known, it is not yet used for this purpose in Australia. The common form is not of tall enough growth to make a good hay plant, but the selection known as Tennessee 76 is used for hay in United States of America.

Feeding Value.—The plant is palatable and of high nutritive value if eaten before it becomes too stemmy. All classes of stock are fond of the green plant and of its hay.

Seed Production.—The usual method employed in Queensland is to pull the maturing plants up, allow them to dry out on a floor, and shake or beat the seed out. In the United States, where seed production is of some importance, harvesting is carried out by a mower with a seed pan attached to the back of the cutter bar, or else the crop is cut and raked while the dew is on it, and run through a grain thresher when dry.

Special Uses.—Lespedeza is used fairly extensively in the South-eastern United States for soil improvement purposes, either in crop rotations or on worn-out cultivation areas, and may prove useful for this purpose in Queensland.

Korean Lespedeza (*Lespedeza stipulacea* Maxim.).

Origin and Distribution.—Like the common lespedeza, Korean lespedeza is a native of the Orient and is cultivated most commonly in the United States, particularly in the warm temperate States, north of the sub-tropical Gulf States. The legume has been tried in Australia, but in Queensland at least appears to be of less general promise than the common lespedeza.

Description.—Korean lespedeza is annual in habit and is a summer grower. The leaves are broader than those of common lespedeza and the plant is generally larger and coarser. The seeds are borne in the axils of the leaves on the ends of the branches.

Climate Requirements.—In the United States, Korean lespedeza can be used in areas experiencing a fairly protracted winter, because the seed germinates at a moderately low temperature, and the plant matures early and so sets seed before the onset of frosts.

Soils.—Practically any type of soil is said to suit this legume.

Planting.—Korean lespedeza is utilised similarly to the common lespedeza and should be planted as indicated for *Lespedeza striata.*

Management, Conservation and Feeding Value.—The remarks made under these headings in the section dealing with common lespedeza apply also to Korean lespedeza.

Townsville Lucerne (*Stylosanthes sundaica* Taub.).

Origin and Distribution.—Townsville lucerne is a native of Brazil and other tropical American countries and now has a wide natural distribution as a weed in warm countries. It has been naturalised in

Queensland for many years and within the past 20 years has been spread both naturally and by artificial means over a lengthy strip of coastal country in North Queensland.

Description.—Of annual habit, Townsville lucerne (Plate 230) is a shrubby plant with numerous branches each up to 3 feet or so in length and clothed in a greyish down. The branches are often prostrate, but erect branches up to 2 feet high are produced. The leaflets occur in threes on short stalks. The flowers are small and occur in dense rounded heads at the ends of the stems. The "seed" is small, angular and grooved across the middle and has a stiff hooked bristle at one end.

Plate 230.

Townsville lucerne.

Climatic Requirements.—Townsville lucerne is a summer-growing legume which germinates following spring or early summer rains and matures prior to the following winter. Since the plant depends for its regeneration on self-sown seed, it is only in areas with a long summer that Townsville lucerne is of permanent value. Though it will survive fairly long, dry periods, it will only develop properly under fairly high rainfall conditions. Little success has been attained south of Rockhampton or outside tropical areas with an annual average rainfall of about 40 inches or more.

Soils.—Provided moisture conditions are satisfactory, Townsville lucerne will thrive on a variety of soil types, from cultivated scrub soils to poor forest soils. Apparently it can tolerate a high degree of soil acidity, but a well-drained soil is desirable.

Planting.—The plant is propagated by means of seed, which is fairly plentifully produced in the main growing areas. What is commonly considered as the seed is really a hard pod containing the seed. Unless their surface is scratched to permit of easier uptake of moisture by the seed, the pods are likely to lie in the ground for some time before germination occurs.

The chief use of Townsville lucerne is as a constituent of permanent pastures, either native or artificial, and it is commonly sown down on established pastures. Where practicable, it is desirable that a form of seed-bed be provided by discing or peg-harrowing of the pasture, followed by a brush-harrowing to cover the seed. The best time to plant is with the advent of the summer wet season, though earlier planting is advisable if spring rains occur. In order to get the legume started on a property, scattered small areas might be sown at the rate of 1-2 lb. of seed per acre. These areas would serve as distribution centres, since the seed is readily spread in manure, on the hair of animals, &c.

Management.—Townsville lucerne is less likely to bloat ruminants than are lucerne and the common clovers, but where the plant is plentiful, bloating must be guarded against. Intermittent grazing should be practised and seeding must be permitted.

Conservation.—Neither hay nor silage are as yet made from Townsville lucerne.

Feeding Value.—The rank growth produced by the plant at the height of the rainy season is apparently not relished by stock, but as the plant commences to dry out from March onwards, stock readily eat it. Since the plant is late in maturing, the dry autumn encourages self-haying and the dry material, even when it has shattered, is greedily eaten. This autumn feed is particularly valuable. The nutritive value of Townsville lucerne is high, though the dry, stemmy material is much poorer than lucerne.

Special Uses.—Whilst at present Townsville lucerne is used mainly for pasturage, it is possible that it might have some value for soil renovation purposes, since it can be grown on fairly poor soils.

Undesirable Features.—In some countries the plant has a tendency to spread on to cultivated land and to behave there as a weed. To date there is no indication that the plant will become a pest of any consequence in Queensland.

ANNUAL SUMMER-GROWING PASTURE GRASSES AND FODDER CROPS.

* Sudan Grass (*Sorghum sudanense* Stapf).

Origin and Distribution.—Sudan grass is a native of tropical North Africa, now extensively used in most subtropical and tropical agricultural areas as a summer pasture plant. In Queensland it is perhaps the most commonly used annual summer pasture.

Description.—Normally, Sudan grass is annual in habit, though it may last for two or three years on occasions. It is a tufted plant which stools freely, the stems reaching a height of up to 10 feet. The thickness of the stems is very variable, but is seldom greater than $\frac{1}{8}$ inch. The length of the leaves also varies greatly, the length being up to 2 feet and the width ½ to ¾ inch. The erect leafy stems eventually produce spreading flower heads. The root system is fibrous and there is no development of underground rootstocks such as characterise Johnson grass.

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* A special leaflet dealing with Sudan grass is available on application to the Department of Agriculture and Stock.

Climatic Requirements.—Sudan grass is a summer-growing annual, which is capable of developing on a lower rainfall than most other summer annuals. In Queensland it is grown without irrigation in the driest agricultural districts as well as in fairly wet districts. Early seedlings are easily killed by frost.

Soils.—Whilst it prefers rich loams, Sudan grass will produce a crop on a large number of soil types.

Planting.—A thoroughly prepared seedbed is as necessary for Sudan grass as for similar crops. Sowing should be carried out in spring or in early summer, a seeding rate of 5—15 lb. per acre being used. The quantity of seed used depends on the method of sowing and the district, lower rates being employed in dry districts and when the seed is drilled in. Occasionally Sudan grass is planted in rows about 3 feet apart, but more usually it is drilled close together or broadcast. Sudan grass seed is often contaminated with seeds of the noxious Johnson grass, and seed should always be purchased from a reliable source.

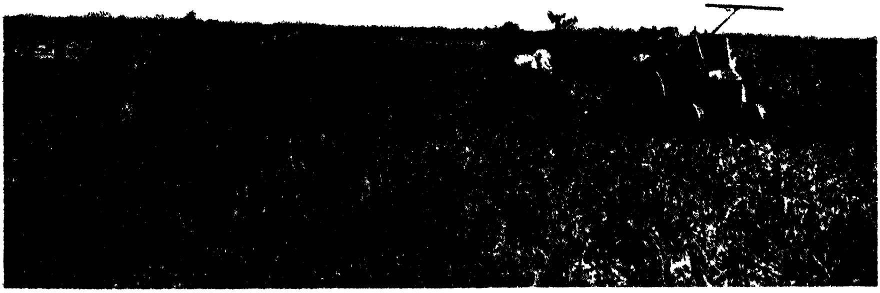

Plate 231.

Harvesting a crop of Sudan grass in Central Queensland.

Mixtures.—Because of its erect growth and good hay qualities Sudan grass is occasionally sown with cowpeas and the mixture ultimately used for hay or silage.

Management.—Sudan grass is used chiefly for hay and for grazing. If used for grazing in the immature stages, careful management must be practised to prevent losses of stock due to prussic-acid poisoning. Whilst the grass is commonly grazed at all stages of growth, frequent heavy losses are experienced. Once the plant has reached the flowering stage all danger of poisoning is passed. The plant may safely be fed after cutting and wilting, but wilted young growth prior to cutting is extremely dangerous.

The grass makes rapid recovery after grazing and several grazings are obtainable during the growing period.

Conservation.—For hay purposes, Sudan grass is a very suitable plant, since it is a heavy yielder in a short time, cures readily and makes a good class of hay. The earlier cuttings should be made when the crop is commencing to flower and the last cut when the grass is in full bloom. Three or four cuttings may be expected during a season.

Sudan grass is an excellent silage crop, either stacked or chaffed.

Feeding Value.—Stock readily eat Sudan grass in all stages of growth and as hay or silage. It is advisable to chaff stemmy growth before feeding. The feeding value of the grass is excellent, though it falls considerably as the plant matures.

* Sorghums (*Sorghum vulgare* Pers.).

Origin and Distribution.—The cultivated sorghums originated in northern Africa and the warm Asiatic countries and are now very extensively grown in all warm countries for green feed, silage and grain.

Plate 232. [*Photo. W. C. Miller.*

A young sorghum crop in the Central-West.

Description.—There are two main classes of sorghum grown in Queensland, namely the saccharine or sweet sorghums, grown for fodder purposes, and the grain sorghums, grown for their grain. There is a wide variety of types, but all are tufted, erect, stooling plants with fairly thick stems and long, broad leaves.

Climatic Requirements.—Sorghums can be grown without irrigation in all the agricultural districts of Queensland and they are the most suitable fodder and grain crop for dry districts.

Soils.—Whilst fertile soils produce the heaviest crops, good results are obtained with the sorghums on many soil types.

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* Special pamphlets dealing with sorghums are obtainable from the Department of Agriculture and Stock.

Planting.—Sorghums should be sown only on well-prepared land, and planting should be carried out during the spring or early summer. Since the crop is being grown for harvesting, it is advisable to sow in well-spaced drills, about 5 lb. of seed per acre being used.

Management.—Owing to the great danger of poisoning, saccharine sorghums should not be grazed by stock, but should be harvested before feeding. For fodder purposes, the best time to cut is when the grain is formed but still soft, but the nutritive value is retained in a large measure well after this stage is passed. The crop is usually cut in small sections with a cane knife, but is most readily harvested by a maize binder.

Conservation.—The saccharine sorghums make good silage and are commonly ensiled.

The grain sorghums are heavy yielders in most districts.

Feeding Value.—Saccharine sorghums are very palatable and nutritive if fed when chaffed and before too mature.

* **Maize** (*Zea mais* L.).

Origin and Distribution.—Maize is a native of subtropical America and is extensively grown in most warm countries, chiefly for grain, but also for green fodder and silage.

Climatic Requirements.—Maize is a summer-growing annual, which requires a moderate to fairly high rainfall, together with a fairly long growing season. It is somewhat drought resistant, but has not the same power of recovery from dry spells as has sorghum. It frosts fairly easily.

Soils.—Most good quality soils, provided they are well-drained, are satisfactory for maize.

Planting.—The seed should be planted only on well-prepared land. The time of planting depends on the district and the variety and extends from August to January. Sowing in drills is desirable, a seeding rate of about 10 lb. per acre being employed.

Management.—The green crop has its highest feeding value when in cob and the grain glazed, but is often cut before coming into ear in order to supply feed which is urgently required. The crop may be cut by hand with a cane-knife or harvested with a sledge-cutter (Plate 233), or the maize harvester.

Conservation.—For silage purposes maize should be cut when fairly green and succulent. The best time is when some of the ears are dented or glazed, a portion of the husks are dry and the upper leaves are still green. Older growth which has failed to mature its grain may be conserved as stover, the cut material being cured in the field. The grain is, of course, readily conserved, either in the crib or in tanks.

Feeding Value.—The feeding value of green maize, maize silage, maize stover and maize grain is fairly good, but maize and its products must be balanced with some protein concentrate to provide a production ration.

*** A special pamphlet on Maize Cultivation is available from the Department of Agriculture and Stock.**

Plate 233.
A sledge cutter at work in an immature maize crop.

*"Millets" and "Panicums".

Description.—There is a good deal of confusion regarding the identity of the various types of quick-maturing fodder plants embraced in the terms "millets" and panicums." The following classification is adopted in this discussion:—

White Panicum (*Echinochloa crus-galli* var.). (Plate 234.)

Japanese Millet (*Echinochloa crus-galli* var. *edulis*). (Plate 234.)

French Millet (*Panicum mileaceum*).

Giant Setaria (*Setaria italica*). (Plate 235.)

Dwarf Setaria (*Setaria italica*).

Climatic Requirements.—The various plants listed above are all summer-growing annuals which are readily killed by frosts. They exhibit drought resistance in varying degrees, but all are able to survive short periods of dry weather and to develop on a fairly low rainfall. Even in our driest agricultural districts they can be relied upon to produce feed in most years.

Soils.—Whilst they do well on a variety of soil types, fertile clay loams or sandy loams are favoured.

Planting.—The millets, &c., are all propagated by seed and from 10 to 15 lb. per acre of seed are necessary to produce a good stand. The quality of the seed is usually high and a minimum germination percentage of 75 for commercial seed is prescribed by the Pure Seeds Acts. The seed may be broadcast or drilled and should, of course, be sown on well-prepared land. Sowings may be made at any time during spring or summer and often the crop is used as a catch crop, to take the place of an agricultural crop which has failed for one reason or another. Good grazing will be provided in five to six weeks if weather conditions are favourable.

Management.—The crop should be permitted to establish properly before being grazed off. Usually 8 to 9 inches of top-growth should be allowed to develop. After the initial grazing, if this is not made too late, the crop will respond fairly well and produce a second grazing or cutting.

Conservation.—The millets, panicums, &c., make a good class of hay, if cut when the grain is forming. Owing to their succulent nature, they take some time to cure. The plants are also very suitable for silage.

Feeding Value.—All classes of stock find these crops very palatable and their nutritive value is high.

Undesirable Features.—Owing to their free-seeding habit the danger of volunteer growth of millets to succeeding crops is high and care should be taken to prevent the ripening of seed if subsequent extra working of the land is to be avoided.

*** A special pamphlet dealing with millets, &c., is available on request to the Department of Agriculture and Stock.**

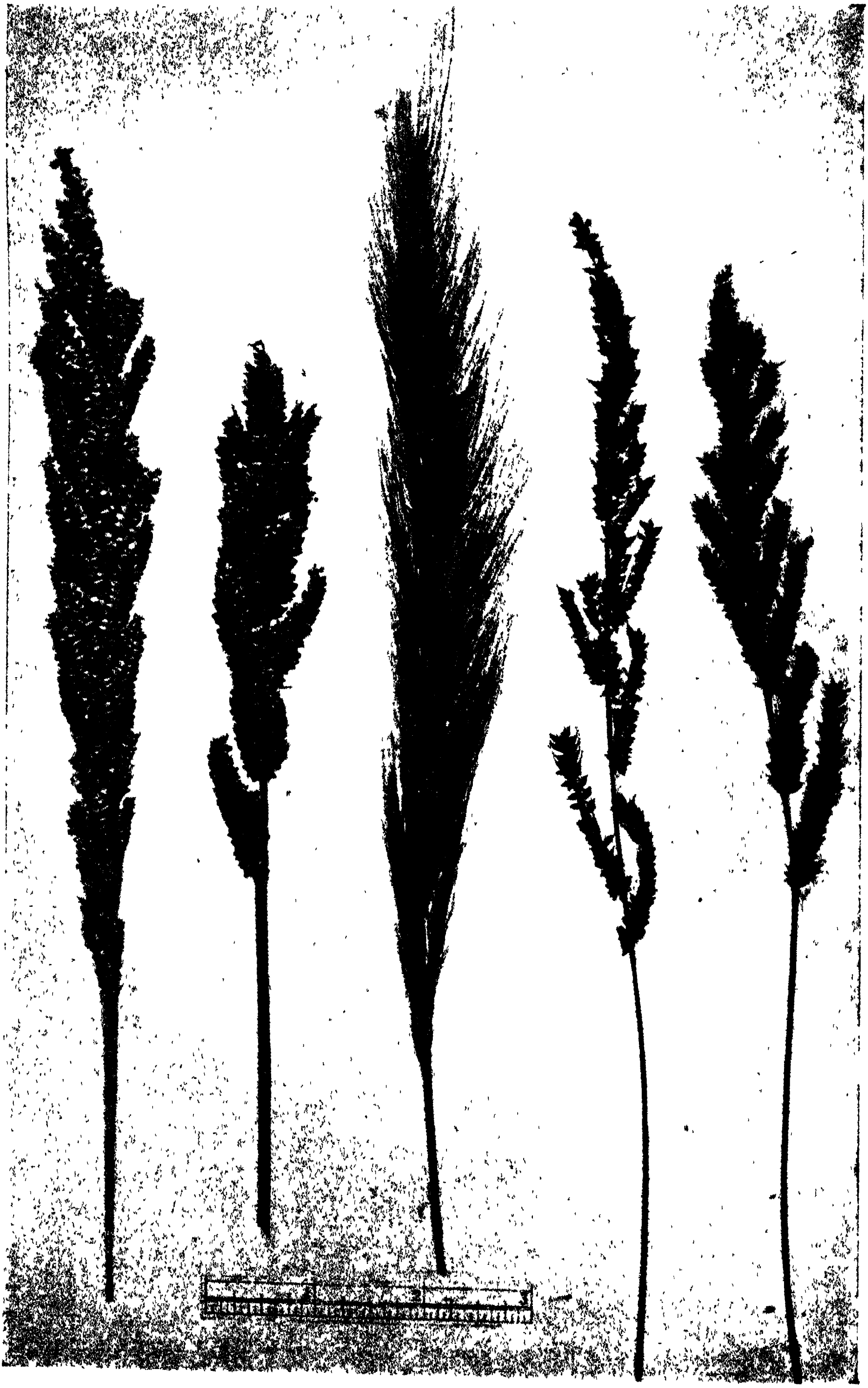

Plate 234.

Seedheads of various millets. From the left—white panicum, Japanese millet, and three forms of wild millets.

Plate 235.
Seedheads of two forms of Setaria.

* **Cowpea** (*Vigna unguiculata* (L.) Wallp.).

Origin and Distribution.—The original home of the cowpea was Central Africa, but it has been cultivated for many centuries in the warmer parts of the Old World and in addition is extensively grown in the Americas and in Australia. Its main uses in Queensland are green-manuring, fodder and hay.

Description.—The cowpea (Plate 236) is a fairly shallow-rooted, annual plant with a branched tap-root. According to the variety the growth habit varies from trailing vines to tall, bushy forms. The large leaves consist of three leaflets. The flowers are white, or pale violet, and the cylindrical pods are several inches long. The pods are filled with numerous speckled, bean-shaped seeds.

Plate 236.

A cowpea crop on a North Queensland farm.

Climatic Requirements.—Being of tropical origin, the cowpea is a summer-grower, but is able to thrive on a fairly low summer rainfall. In Queensland it is used in all the agricultural districts, including the fairly dry Maranoa district. It is not sufficiently drought-resistant, however, to really thrive in low rainfall areas. Frosts are destructive of the crop.

Soils.—The cowpea will grow on many different types of soil, provided they are well-drained, and will thrive on soils more acid than those required by lucerne.

Planting.—It is necessary to till the land well before planting. The seed should be planted after danger of frosts has passed, and may be broadcast at the rate of 25 to 40 lb. per acre or drilled in rows 2 feet 6 inches apart, 5 to 15 lb. of seed per acre being used. Locally suitable varieties should be used.

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* A special pamphlet is available from the Department of Agriculture and Stock.

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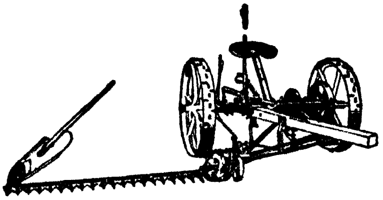

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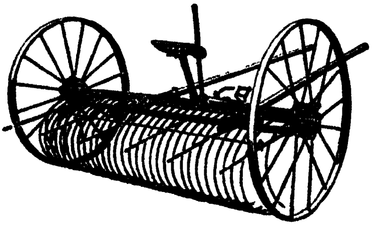

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Management.—The crop can be grazed by stock during its growing period. For hay purposes, it is best cut when a fair proportion of the flowers have formed pods. The crop is somewhat difficult to cure properly.

Feeding Value.—The feeding value of cowpea, both green and cured, is excellent. Dairy stock do not readily take to the green material at first, but later acquire a taste for it.

* Velvet Bean (*Mucuna* spp.)

(including Mauritius Bean (*Mucuna aterrima* Holl.) and Florida Velvet Bean (*Mucuna deeringiana* (Bort.) Holl.).

Origin and Distribution.—The various types of velvet bean are natives of tropical countries and are employed in a number of tropical and subtropical areas chiefly for green manure purposes. It is for green manure that the crop is mainly used in Queensland, but it is utilised also for grazing, though only to a small extent.

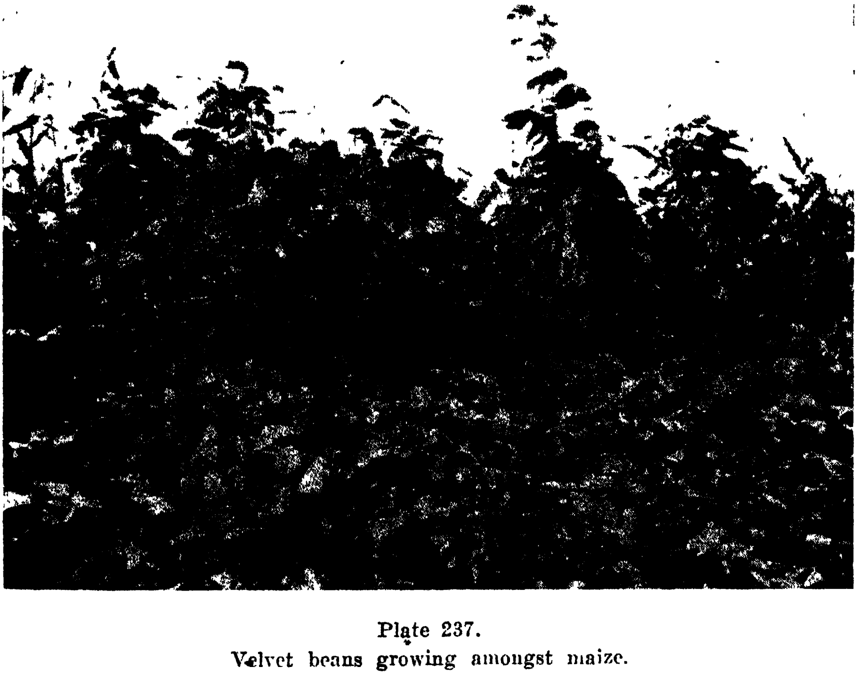

Plate 237.

Velvet beans growing amongst maize.

Description.—Velvet bean (Plate 237) is an annual plant, varying in habit from bush types to vine types. The plants have fleshy surface roots and stems and the vine types often spread over a large area. The leaves are large and occur in groups of three leaflets. The large flowers are borne singly or in small groups and are variously coloured from white to purple. The pods are from 2 to 6 inches long and in some varieties are hairy. The seeds are large, but vary in shape from globular to oblong and are white, mottled, brown or black in appearance.

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* A special pamphlet is obtainable from the Department of Agriculture and Stock.

Climatic Requirements.—The velvet bean is a summer grower and requires a fairly heavy summer rainfall and a long growing season. Best results are obtained in the tropical north coast: elsewhere cowpeas usually are employed as an alternative to velvet bean.

Soils.—A well-drained fertile soil is desirable, and a wide range of soil types is suitable for the crop. It will grow on soils too acid for lucerne or clovers.

Planting.—Sowing should not be commenced until danger of frosts is passed, but early sowing is desirable, especially of the late-maturing varieties. The land should be well cultivated. The method of planting varies according to the purpose of sowing. When sown in a pure stand for hay, grazing or green manure, the crop is planted in drills 4 or 5 feet apart, with 12 to 18 inches between the seeds. Between 10 and 20 lb. will seed an acre.

Sometimes velvet bean is sown with maize or sorghum to provide a mixed grazing or silage crop. The bean seed may be sown either at the same time as, or later than, the maize or sorghum seed.

Management.—In the early stages of growth of the velvet bean, weeds should be kept down by cultivation. When the plants are well established, grazing may be commenced, but should be intermittent in character.

Conservation.—For hay purposes, velvet beans are best harvested by hand-cutting, when the crop is in early flower. The wilted plants are cocked for a few days before stacking. When grown in a mixed stand, a useful silage may be made from velvet beans.

Feeding Value.—The vines are extremely palatable to stock and possess a high feeding value. The mature beans also provide good feed.

* **Peanut** (*Arachis hypogea* L.).

Origin and Distribution.—A native of Brazil, the peanut is grown in a number of tropical and subtropical countries for the edible "nut" which it produces. In Queensland a fairly large area in the Burnett, and in more tropical districts, is sown annually to the crop.

Description.—The peanut is a thick-stemmed annual plant of either bushy or creeping habit and possessing a thick tap-root. There are four large leaflets in each leaf, and the stemless, yellow flowers occur at the bases of the leaves. When the flower is fertilized, it develops a long stalk, which carries the flower (minus its petals) into the ground, where the fruit is matured.

Climatic Requirements.—A long, warm-growing period, with moderate rainfall, is necessary if fruit is to be matured.

Soils.—Loose-textured soils are essential to permit of the flower being buried and to facilitate harvesting, and light, sandy loams, not too acid and with a good humus content, are recommended.

Planting.—A well-tilled seed-bed should be provided and the seed sown in spring or early summer in drills.

Management.—Whilst the usual practice is to market the nuts and to cure the tops for feeding to stock, on occasions the standing green crop is grazed, especially by pigs, which are able to use also the underground nuts.

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*A special pamphlet dealing with peanut cultivation is available.

Conservation.—Peanut tops make a very rich hay and should be cured in the manner recommended in the special pamphlet, which is available from the Department of Agriculture and Stock.

PERMANENT WINTER-GROWING GRASSES.

Toowoomba Canary Grass (*Phalaris tuberosa* L.).

Origin and Distribution.—Though it might appear from the common name of this grass that it is a native of Queensland, the plant originated in the Mediterranean region. It was introduced to Australia for trial purposes over 50 years ago, being first sown in this country at the Toowoomba Botanic Gardens in 1884. Small quantities of seed were distributed from Toowoomba to various States, but it was not until twenty years after its introduction that it came to the notice of agriculturists in Southern Australia as possessing the valuable properties of drought-resistance, permanency, high productivity and adaptability to varying soil types. It was slowly brought into more extensive use, and during recent years the demand for seed has been heavy.

Plate 238.
Phalaris tuberosa.

Description.—*Phalaris tuberosa* is a deep-rooted perennial plant, which increases in size by means of short, underground runners. The tufts produce, during the winter and spring months, a large quantity of palatable and nutritious leafage. The production of seed stalks is limited under grazing conditions.

Climatic Requirements.—For maximum production during its autumn-spring growing period, Phalaris requires a moderate to heavy winter rainfall, and is best suited to areas experiencing such conditions. It is, however, fairly productive during short, dry periods, although dormant under drought conditions. Severe frosts do not injure the grass.

Soils.—So far as soil conditions are concerned, Phalaris prefers a rich, well-drained soil, but will do well on a wide range of soil types possessing these characteristics. The nitrogen requirements of such a high-producing grass as *Phalaris tuberosa* are high, and soils rich in organic matter or other form of nitrogen should be selected.

Planting.—The sowing of Phalaris pastures should be performed during the autumn months. The seed is of light weight, and as only a small bulk per acre is required, the seed should be mixed with some filler, such as superphosphate or sand, to facilitate distribution, whether by drilling or by broadcasting. *Phalaris tuberosa* seed is somewhat erratic in its behaviour, as far as germination is concerned. Some lots germinate well over 80 per cent., other lots fail to reach the 55 per cent. minimum, which operates in most States. It is advisable to purchase Government Certified seed, which, in addition to being approved with regard to origin, also carries a seed-tester's certificate, showing the percentage germination at the time of testing. By purchasing Government Certified seed the buyer can be certain of securing seed from pastures of a truly perennial type, and does not run the risk of purchasing seed contaminated with seeds of short-lived types of Phalaris.

Phalaris is a grass which takes some time to establish its root system, and is sensitive to severe competition during its early stages. Consequently, care should be taken that the grass is sown only under conditions in which it will not be subject to heavy competition for soil moisture, &c. For instance, it should not be sown on poorly-worked cultivations contaminated with weed seeds; nor simply broadcasted on existing pastures. The only really satisfactory way of establishing good Phalaris pastures is to sow down on fertile, well-cultivated soils with a minimum of other plants in the mixture. A legume is desirable in the pasture and lucerne, red clover or white clover could be included without affecting the establishment of the Phalaris. Sometimes a light seeding of quick-growing grasses, such as rye grasses, is made to provide feed while the Phalaris is establishing, but in most instances, the Phalaris should be given the least possible opposition. The rate of sowing should be about 4 lb. per acre of Phalaris seed, together with 2 lb. of seed of one of the legumes.

Management.—A pasture of Phalaris should be permitted to establish itself before being grazed, and during the first year only light intermittent grazings should be made. In subsequent years the pasture will stand up to heavy stocking at intervals, provided sufficient time for recovery is allowed between grazings. Whilst Phalaris will make some growth during the summer months, it is inadvisable to subject the grass to grazing conditions then, since the plant is weakened and will not produce heavily during the following growing season.

Like paspalum, Phalaris is likely to become sod-bound after a few seasons of grazing, but the pasture can be kept in good condition by periodical renovation, commencing during its second season of growth. Renovation is best effected by means of a drastic harrowing with a rigid tine implement of deep penetration. The operation should be carried out in spring, so that the storms which may be expected at that time will help the torn plants to recover.

Conservation.—Phalaris makes a very fine type of hay and a useful silage.

Feeding Value.—All classes of stock relish the succulent feed produced by Phalaris, and the grass is extremely valuable for fattening and for cream production.

Seed Production.—It is probable that the growing of Phalaris for seed would prove satisfactory at one or two centres on the Darling Downs, but under general grazing farm conditions seed production is very unreliable.

Perennial Ryegrass (*Lolium perenne* L.).

Origin and Distribution.—A native of Europe, perennial ryegrass now enjoys considerable favour in many temperate and cold temperate climates. It is of considerable importance in New Zealand, South Australia, Victoria, Tasmania, and New South Wales, but in Queensland has a very limited distribution.

Description.—Perennial ryegrass is a long-lived tufted grass with characteristic soft, green leaves. It tillers well and forms a close sward. The leaves may reach a length of 18 inches, under favourable conditions.

Climatic Requirements.—The climates in which perennial ryegrass thrives are those of New Zealand, England, and like climates, and the climate of Queensland is for the most part unsuited to the grass. The main causes of the failure of the grass in most parts of Queensland are dry winter conditions (i.e., during the normal growing season of the grass) and high summer temperatures. When one or both of these conditions are not severe some success has been attained, e.g., on the southern highlands and on moist soils on the south coast.

Soils.—Perennial ryegrass will thrive only on well-drained fertile soils. It is definitely not a suitable grass for sowing under any but good conditions of soil and climate.

Planting.—Sowing of perennial ryegrass should be carried out in the autumn following adequate preparation of the soil. Commercial seed is usually of good quality, and a minimum germination percentage of 60 per cent. is prescribed by the Pure Seeds Acts. The question of the variability of perennial ryegrass, according to its place of origin, has been studied in some detail, and as a result seeds carrying a Government guarantee of conformity to a desirable pasture type are on the market. Such seed should be purchased in preference to uncertified seeds, which may or may not be from desirable pastures. The field germination of perennial ryegrass is very reliable.

In those restricted areas, to which perennial ryegrass is suited, permanent winter pasture mixtures should have this grass as their basis. The other plants in the mixture should include a clover and one of the annual ryegrasses to provide some quick feed while the perennial plants are becoming established.

Management.—Pastures of perennial ryegrass will withstand fairly heavy grazing, but intermittent grazing is desirable. The pasture should be spelled during the summer months.

Conservation.—Perennial ryegrass may be conserved as hay or as silage. For silage purposes the grass should not be harvested whilst in a very young condition.

Feeding Value.—In most instances perennial ryegrass is very palatable to all classes of stock. Its feeding value is of a high order and the grass is particularly valuable for dairy stock.

Cocksfoot (*Dactylis glomerata* L.).

Origin and Distribution.—Cocksfoot is a native of Europe but is now cultivated for grazing in Africa, Asia, America, New Zealand, Australia and other countries. In Queensland it is grown to only a small extent, chiefly on elevated coastal country in the south-east.

Description.—Cocksfoot is a perennial grass of tufted habit, with dark green leaves. It is an extremely leafy grass, producing very few flower stalks. In the best types leafy shoots are produced in profusion from the whole of the crown; in inferior types the shoots are mostly marginal.

Climatic Requirements.—Cool, moist conditions rather than the hot and oftentimes dry climate of the Queensland grazing areas are most favourable to cocksfoot: hence the grass is really successful only in the Springbrook, Tamborine, Maleny and Granite Belt areas. Elsewhere it is not likely to become more than a minor pasture grass.

Soils.—An important feature of cocksfoot is its adaptability to a wide range of soil types. Under suitable climatic conditions it will thrive in almost any type of agricultural soil except sands. Moist clay loams suit it best.

Planting.—Sowings of cocksfoot should be made in the autumn months, as the seedlings require cool conditions during establishment. The germinating capacity of commercial cocksfoot seed is seldom very high, a sample germinating 75 per cent. being considered quite good. The Pure Seeds Acts prescribe 50 per cent. as the minimum and occasional samples are below standard. The productive period of cocksfoot is during spring and summer, though it is able during the cooler months to provide some feed. As a component of permanent winter pasture mixtures it is valuable in extending the grazing season into the warmer months. Because of its cool weather production it is useful also in paspalum pastures. If sown alone cocksfoot should be sown at the rate of 15 to 20 lb. per acre in order to encourage a thick sward. If a good initial stand is not obtained the pasture is inclined to become tussocky.

Management.—Intermittent grazing should be practised and regular light harrowings given.

Conservation.—No cocksfoot hay is conserved in Queensland, though the grass is cultivated for hay purposes in some temperate countries.

Feeding Value.—The palatability of cocksfoot is fairly good and its feeding value is of a high order.

Seed Production.—Under Queensland conditions little seed is produced by the grass and collection is not economic.

SELF-GENERATING ANNUAL WINTER-GROWING GRASSES.

Wimmera Ryegrass (*Lolium* (?) *subulatum* Vis.).

Origin and Distribution.—Believed to have been brought from Europe to Victoria in 1887, Wimmera ryegrass is now a widely used grass in fairly dry areas in various Australian States. It has been used spasmodically in Southern Queensland for many years but it is only recently that any extensive area has been sown.

Description.—Wimmera ryegrass (Plate 239) is a tufted annual plant, very soft in nature but producing many stems, which reach a height of about 18 inches. These stems are produced in abundance in the early spring and seed is set early, after which the plant dies-off.

Climatic Requirements.—Since it is a winter growing grass, Wimmera ryegrass requires winter rains for its growth. It adapts itself to a range of winter rainfall conditions but the minimum rainfall below which it is unproductive is often not reached away from the south coastal area. In years of reasonable rainfall, however, Wimmera ryegrass does quite well in the southern parts of the State as far west as the Maranoa district. Being an annual, Wimmera ryegrass hastens to produce seed in the spring and the length of the grazing period varies considerably according to the seasonal conditions experienced.

Soils.—When grown under low rainfall conditions, Wimmera ryegrass requires to be sown on fertile soil types. In higher rainfall districts it should be reserved for the poorer classes of cultivated land and Italian ryegrass sown on the richer soils for annual winter grazing.

Plate 239.
Wimmera ryegrass.

Planting.—Wimmera ryegrass should be sown down in early autumn on cultivated land. The seed is usually of good germinating power and the grass establishes quite readily in the field. On the South Coast, as much as 8 to 10 lb. per acre may be sown; 4 to 6 lb. per acre, together with 2 lb. of lucerne, should suffice in drier areas.

Because of its easy establishment and quick growth, Wimmera ryegrass is useful for some special purposes. It is often included, in small amounts, in permanent winter pasture mixtures, to provide some grazing while the slower-growing perennials are becoming established. Sometimes it is sown on old lucerne stands to provide better grazing than the weedy grasses which would otherwise invade the area. Quite often it is sown down between the rows of a maize crop at the time of final scuffling to provide grazing when the crop is harvested.

Management.—Intermittent grazing should be practised with Wimmera ryegrass, as with other pastures. In addition, the pasture must be spelled when seed is being set in order to assist the grass to re-establish itself from self-sown seed. After the seed is shed, the dry plants can again be grazed by stock. If the grass is to be cut for hay, grazing should be discontinued sufficiently early to allow of a good hay crop being formed by the spring.

Conservation.—A fairly good hay can be made from Wimmera ryegrass cut before maturity.

Feeding Value.—The palatability of the grass in the green state is good and stock will also eat the mature plants. The feeding value, which is excellent in the younger stages, declines rapidly after maturity.

Seed Production.—Several growers of Wimmera ryegrass in Southern Queensland have collected seed from their paddocks. The grass seeds very profusely and the seed does not shatter easily. The practice adopted has been to mow the grass and thresh it with the ordinary grain thresher.

Pests and Diseases.—Rust occasionally affects Wimmera ryegrass and considerably lessens its grazing value.

Prairie Grass (*Bromus unioloides* H.B. et K.).

Origin and Distribution.—Prairie grass is a native of temperate South America, where it forms an important part of the grazing lands of Argentina, Paraguay, &c., and has now a wide distribution in temperate and warm temperate countries. In Queensland it is common in most of the eastern areas as a weed in sheltered situations, but it is only in the southern districts that it is used extensively for pasture purposes.

Plate 240.
A prairie grass pasture.

Description.—In habit prairie grass is usually annual or biennial, though long-lived types have been obtained and are on the market. The grass forms somewhat small tufts, but tillers quite freely, and the erect stems produce abundant leaf. The very large "seeds" occur in narrow panicles on the seed stalks. The perennial form of prairie grass, which until recently was believed to be entirely different from the common prairie grass, was discovered in New South Wales a few years ago, and has been sown on a small scale in Queensland and New South Wales. Its main point of difference from the annual prairie grass is its long-lived habit. Instead of dying after running to seed before the summer, perennial prairie grass continues to live and to produce feed. Its summer production of leaf is not very large and if the pasture is grazed heavily the crown of the plant is exposed to the heat of summer, and damage results. In Queensland, there is a fairly high mortality among established plants each year, but self-sown seed helps to keep the pasture thick.

Climatic Requirements.—Prairie grass is a winter-growing plant and consequently requires early autumn rains for its germination and follow-on rains to keep it productive until the late spring, when normally it goes to seed and dies off. Only in the southern parts of the State is the autumn-spring rainfall sufficient to produce good prairie grass pastures.

Plate 241.
Prairie grass in seed.

Soils.—Rich loams are the most suitable soil types for prairie grass. On heavy clay soils it is of lesser value, whilst on sandy soils it is of little use.

Planting.—Seed of prairie grass should be sown in the autumn, preferably on well-prepared land. Although the parts of the seed head which are sold for sowing are quite large, the actual seeds within these parts are not very big and only a light covering of the seed should be made. Commercial seed of prairie grass is extremely variable in quality. Some lots will germinate as high as 96 per cent., while occasional lines are quite valueless. The Queensland Pure Seeds Acts prescribe 50 per cent. as the minimum germination permitted. The main causes of low quality seed are harvesting when immature and smut infection. Farmers growing prairie grass for seed purposes require before sowing their seed areas to treat the seed with a disinfectant, such as a mercury dust (e.g. Abavit B or Ceresan at the rate of 3 oz. for every 20 lb. of seed) or a solution of formalin (1 pint of 40 per cent. formalin to 30 gallons of water—sprinkle over the seed at the rate of 1 gallon per bushel the day before sowing).

Management.—The chief use of prairie grass is for winter grazing, either in admixture with summer-growing plants or as a pure stand. It is difficult to maintain prairie grass in association with good grazing types, because of its tendency to be eaten out by stock. The grass forms a crown above the surface of the soil and heavy grazing soon destroys the plants. In order that grazing may be rigidly controlled to prevent the grass being eaten out, prairie grass is best sown apart from other winter grasses. It is commonly sown, however, in Rhodes grass pastures to provide grazing during the dormant period of the Rhodes grass. When sown alone, up to one bushel of seed per acre is recommended. In mixtures, 4 to 5 lb. should suffice. If permitted to seed at the end of its growing season, prairie grass will re-establish itself each year.

Conservation.—Prairie grass is seldom utilised for other than pasture purposes, though it makes a very good hay.

Feeding Value.—Wherever it is grown prairie grass is recognised as one of the sweetest and most nutritious grasses. It is relished by all classes of livestock, has a high feeding value, and is a good cream producer.

Pests and Diseases.—Prairie grass is subject to attack by the smut fungus, which prevents seed formation, and should be protected by seed disinfection. A special pamphlet dealing with the process is available from the Department of Agriculture and Stock, Brisbane.

PERMANENT WINTER-GROWING PASTURE LEGUMES.

White Clover (*Trifolium repens* L.).

Origin and Distribution.—A native of Europe, white clover is the most commonly used leguminous constituent of permanent pastures in practically all temperate countries, including western European States, the United States of America, New Zealand and Southern Australia. Its range extends into subtropical areas, and in Australia white clover is a common naturalised clover in the coastal paspalum-growing areas of New South Wales and Queensland.

Description.—White clover is a perennial legume, with prostrate running stems. There are a large number of commercial types of the clover, which show extensive variation as regards runner development, density of growth, size of leaf, &c. The general habit of the clover is to spread by means of the creeping stems, which root at the joints. Leaf stalks and flowering stems arise from the joints. Each leaf stalk attains a height of 3 to 18 inches, depending on soil and climatic conditions, and bears three leaflets. The flowering stems grow upright and each terminates in a white globular head of flowers.

Climatic Requirements.—The late winter and spring months cover the usual period of growth of white clover in Queensland. What are recognised as good clover years occur on an average once in four or five years, and are characterised by a higher winter rainfall than usual and moist and cool early spring months. Growth is retarded by very warm weather and ceases early in the summer. August to November is the main growing period, and a rainfall of about 12 inches in the May-October period is considered essential for good clover development.

Soils.—Provided sufficient moisture is available, white clover can be grown on a wide range of fertile soil types, but prefers loamy types to sandy or excessively clayey soils. The acidity of the soil must not, however, be high, though white clover is less exacting in its requirements than is lucerne. It is essential that the soil be rich in available plant foods.

Plate 242.
White clover.

Planting.—The sowing of white clover is best carried out during the early autumn months. Spring sowing is less successful, since the young plants resulting from early germination are unable to become established sufficiently well to withstand the rigors of the hot summer. However, a proportion of the seed will lie dormant until the following autumn. Seed of white clover is readily obtainable from seedsmen and is usually of good germinating capacity. A minimum germination percentage of 70 is considered desirable.

The main use made of white clover is in permanent pasture mixtures, and it is either sown down when the pasture is being sown or else it is incorporated in existing permanent pastures. White clover is of particular value in conjunction with paspalum and with Kikuyu grass and is readily established by sowing down on renovated grass areas in the early autumn. In order to encourage the early development of the clover superphosphate should be sown with the seed. Two pounds of white clover seed sown on an acre of renovated grass pasture should form the nucleus for a fairly extensive spread of clover over the area. After the seed is sown, it should be given a light covering by running harrows over the land.

When permanent winter pastures are being sown in suitable districts 2 lb. of white clover seed should be included in the mixture.

The naturalised form of white clover, which is fairly common in some paspalum pastures, has been developed from European types, particularly the white Dutch clover, and tests which have been carried out have shown New Zealand selected types to be superior to the naturalised and European types, consequently New Zealand Government Certified White Clover Seed or the cheaper New Zealand Superfine White Clover Seed should be used, the former for preference.

Management.—The type of management imposed on white clover depends usually on the type of pasture of which it is a component. The system of intermittent grazing suits the clover quite well, since it permits of the accumulation in the roots of food reserves which enable the clover to "come away" quickly after its dormant period, and in addition it prevents excessive shading of the clover.

In some years white clover grows in such profusion that there is considerable risk of stock being "bloated." The usual means to prevent hoven or bloat should be employed.

Since the flower heads of white clover usually are not eaten by stock, no special precautions to ensure the ripening and shedding of seed appear to be necessary.

Conservation.—White clover is primarily a pasture species and is not particularly suitable for use as hay or silage.

Feeding Value.—The palatability and feeding value of the clover when growing in pasture mixtures are good, though a diet of clover alone is unbalanced. The high percentage of leaf among the material available to stock is responsible in a large measure for the high feeding value of the plant.

Undesirable Features.—Injudicious grazing of white clover might result in "bloating" of ruminants.

Red Clover (*Trifolium pratense* L.).

Origin and Distribution.—Red clover, or cow-grass, is a native of Europe and is extensively grown for pasture and hay purposes in temperate countries, including England, United States of America, New Zealand and Southern Australia. In Australia it is used also for winter grazing on the north coast of New South Wales and in south-eastern Queensland.

Description.—In habit, red clover is an upright plant with hairy stems and large hairy leaves. The flowers are borne in fairly large globular heads and are reddish-purple in colour. In temperate areas with a well-distributed rainfall, some strains of red clover are long-lived perennials, persisting for four or five years. Under Queensland conditions two or three years is the maximum life of the plant.

Climatic Requirements.—Though commonly regarded as a winter-growing clover, red clover makes its main growth from August onwards and produces feed right through mild summers. Hot, dry conditions persisting for some time destroy the plants, hence the tropical coast and the drier areas of the State are unsatisfactory for red clover. Only the south-eastern portion of the State appears to be climatically suitable for it.

Soils.—The soils favoured by red clover are clays and clay loams not subject to waterlogging and of alkaline or slightly to moderately acid nature. Medium and strongly acid soils are unsuitable.

Planting.—Owing to the danger of bloating, red clover is seldom sown in a pure stand for grazing purposes. Its main uses are for sowing down in admixture with annual or semi-permanent winter and spring growing pasture mixtures and for sowing down on renovated paspalum pasture. In all mixtures the amount of seed sown per acre should not exceed three pounds. Seed is readily obtainable from seedsmen and is usually very reliable. Seed lots germinating less than 75 per cent. should not be accepted.

Management.—In common with other pasture plants red clover should be grazed intermittently and not continuously. Close grazing is likely to damage the crown of the plant. Where red clover is plentiful in pastures, precautions against bloating of stock must be taken. There is little point in spelling the clover to permit of seed production, for, whilst it does mature a certain amount of seed if rested, red clover is not very efficient in sowing itself down.

Conservation.—In suitable districts a good quality hay may be made from red clover, and when ensiled in admixture with grasses, the clover adds to the value of the resultant silage.

Feeding Value.—The palatability of red clover is somewhat variable, its hairiness apparently sometimes making it unattractive to stock. However, young growth mixed with grass is eaten readily. The nutritive value of the clover is high before the plants become stemmy in nature.

Seed Production.—The amount of viable seed produced under Queensland conditions is small and the growing of the clover for seed production purposes is unlikely to be a successful commercial proposition.

Special Uses.—Red clover is occasionally sown in New South Wales as a rotation crop with maize and may have some value for this purpose on alluvial flats on the coast in Queensland.

Undesirable Features.—The succulent character of red clover renders "bloating" a danger if proper precautions are not taken.

Alsike Clover (*Trifolium hybridum* L.).

Origin and Distribution.—Alsike clover is a native of northern Europe and is cultivated there and in other cool temperate countries. It is very little used in Australia, where red clover and white clover can be grown with greater satisfaction.

Description.—Though in suitable countries Alsike clover has a life period of 4 to 6 years, in Queensland it is very short-lived and may be regarded as an annual. It is an upright, leafy plant with branching stems and a thick taproot. The leaflets occur in groups of three and the white or pink flower heads are borne on long stems. The small pods each have 2 to 4 seeds.

Climatic Requirements.—Alsike clover is a winter and spring grower, which requires a fairly moist growing season. In Queensland it usually dies in early summer owing to the heat.

Soils.—Most moderately fertile soils are suitable for Alsike clover and it will thrive on fairly moist soils.

Planting.—Alsike clover is not likely to be used to any extent in Queensland, and if its use is increased it will probably be in winter pasture mixtures, when one pound of seed per acre should suffice.

Conservation.—A good quality hay is made from Alsike clover.

Feeding Value.—The feeding value of the clover is quite good, but "bloating" must be guarded against.

Strawberry Clover (*Trifolium fragiferum* L.).

Origin and Distribution.—Strawberry clover is a native of the Mediterranean regions of Europe, Asia and Africa and is cultivated to a small extent in various warm temperate areas. In Australia it is utilised in the Southern States for growing in damp areas, but Queensland experience with the clover is too limited to generalise regarding its potential usefulness in this State.

Description.—Resembling white clover in habit, strawberry clover is a perennial plant with creeping and rooting stems and erect leaf stalks and flowering stems. Each leaf stem carries three leaflets and the globular flower head, when mature, has the appearance of a strawberry fruit.

Climatic Requirements.—Strawberry clover makes most of its growth during the warmer months of the year and requires a well-distributed annual rainfall if not grown in damp places. It will not do too well in hot, dry weather unless supplied with abundant soil moisture.

Soils.—Provided soil conditions are not extremely acid, strawberry clover will grow on all fairly fertile moist soils.

Planting.—If runners are not readily available the clover should be started by sowing seed, but planting of runners is much more reliable.

Management.—The clover is well adapted to grazing and will survive heavy stocking if given time to recover between grazings.

Feeding Value.—Its palatability and feeding value are good.

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Burr Medic (*Medicago denticulata* Willd.).

Origin and Distribution.—The native home of burr medic, which is also known as burr clover, burr trefoil, trefoil or clover, is Europe, but the plant now has a wide distribution in many other temperate countries, including Argentina, United States of America, and Australia. It is naturalised in some parts of Queensland, particularly on the Darling Downs and in the Maranoa and in addition is sown to a small extent.

Description.—Burr medic is an annual plant with prostrate or weakly ascending stems. The leaflets are borne in groups of three at the end of a long leafstalk and have serrated edges. The flowers are small and yellow and occur in groups of 2 to 8 on short stalks. The pods are disc-shaped and are made up of two or three coils. They are about ¼ inch in diameter and are covered with hooked spines.

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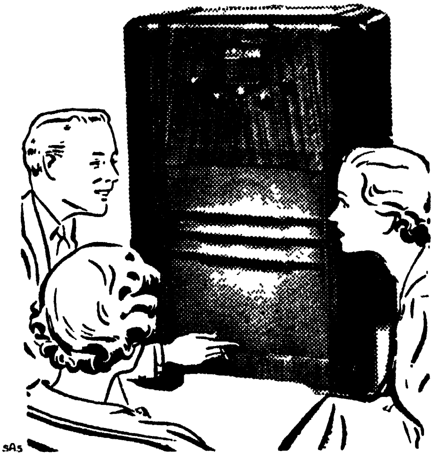

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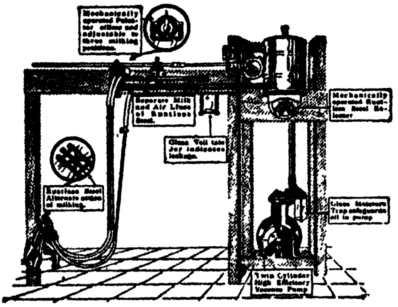

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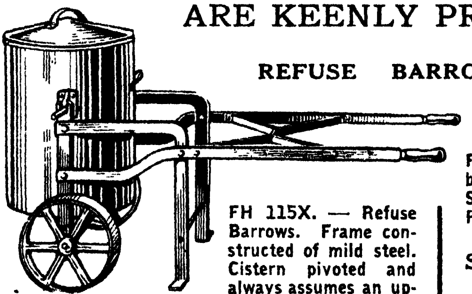

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Climatic Requirements.—Whilst burr medic makes its early growth during the winter months, it prefers mild winter growing conditions to very cold conditions and its most rapid development is made during the warm months of early spring. As hot weather commences the plant dies off. The seeds germinate in autumn and fairly regular winter rains are required to keep the plants growing. Nevertheless, the legume can survive moderately long, dry winter periods and is one of the hardiest of the fodder legumes.

Soils.—The soils most favoured by burr medic are the heavier types of alluvials or basalt soils, and these must be well supplied with lime. The very acid soils of the coast are unsuitable, as are also sandy soils.

Planting.—Most of the burr medic grazed in Queensland is of voluntary growth and little is sown. Seed is, however, available at a cheap rate and areas of native pasture in which the legume does not occur might, in suitable districts, be sown with seed of the legume. Sowing must be carried out in the autumn and 2 lb. of seed per acre should suffice in most southern districts.

Management.—Prevention of bloating is the chief point to observe in the grazing of burr medic. It is necessary also that the plant be permitted to seed itself down in early summer and this means protection or light stocking while the pods are maturing. The plants produce abundant pods, each with 3 to 6 seeds, and these lie in the ground until the seeds germinate with autumn rains.

Conservation.—In certain districts burr medic grows in sufficient quantities to merit its conservation as silage.

Feeding Value.—The young green plants do not appear to be as palatable to stock as semi-mature growth or green material cut and wilted. The protein and mineral contents are high in both young and fairly old plants and the legume is a very useful fodder. The seeds after being shed are readily eaten by stock and provide a good deal of nutritious feed.

Undesirable Features.—In wool-growing districts, burr medic causes some trouble, because of the tendency of the hard, spiny pods to cling to the fleece.

Black Medic (*Medicago lupulina* L.).

Origin and Distribution.—Black medic, which also is known as English trefoil or yellow trefoil, is a native of Europe, and is used to a slight extent in various other temperate areas. Though it has been naturalised in Australia for many years, it has not spread naturally to any great extent and is found chiefly in cool districts. On the New England Tableland of New South Wales the legume is fairly widely used in pasture mixtures, but its present use in Queensland is very limited.

Description.—The legume is a mixture of perennial and annual types, but under Queensland conditions appears to behave for the most part as an annual. The plant has small leaves and prostrate stems. The flowers are small and yellow and are borne in globular heads on the end of fairly long-flowering stems. The pods are free of spines but are twisted.

Climatic Requirements.—Black medic is a winter and spring grower and prefers a cool, moist growing season. It provides earlier feed than most other legumes, but also matures fairly early. It has a moderate degree of drought resistance, being intermediate in this respect between white clover and lucerne.

Soils.—Black medic evinces a preference for heavy soils and is of little value on sandy soils. Acid soils are apparently unsuitable and soils lacking in phosphates require the application of a phosphoric manure to encourage the legume.

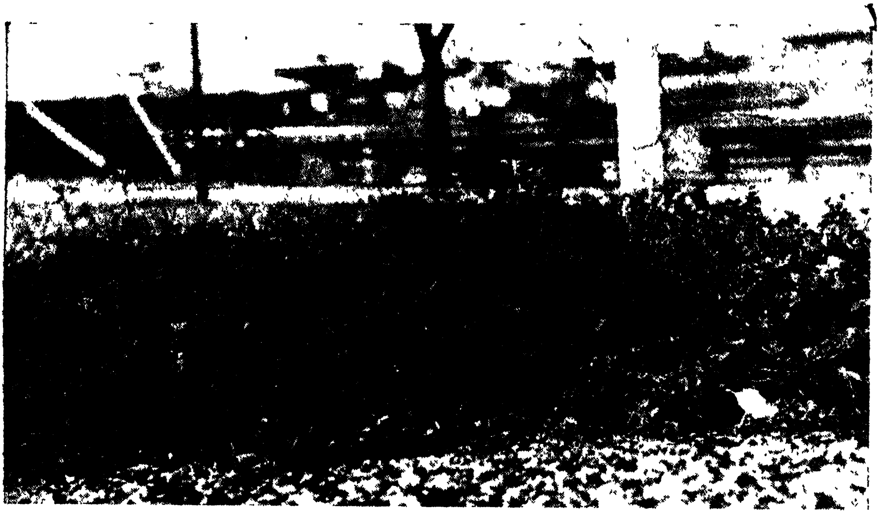


Plate 243.
Burr Medic.

Planting.—Pure stands of black medic do not form a suitable type of pasture and the main use of the legume is in pasture mixtures. Two or three pounds per acre in winter pasture mixtures are recommended and similar quantities may be sown on renovated Rhodes grass or native grass pastures. Autumn sowing is desirable.

Feeding Value.—Both the palatability and the feeding value of black medic are good.

Clustered Clover (*Trifolium glomeratum* L.).

Origin and Distribution.—A native of the Mediterranean region and western Europe, clustered or ball clover is a hardy annual naturalised in all States of Australia and sown to a slight extent for pasture improvement. In Queensland it is common on fairly dry soils along the coast and in the drier agricultural districts.

Description.—The plant is an annual with spreading prostrate stems along which leaves are produced on fairly short stems. Globular heads of pink flowers are formed at the base of the leaf stalks and themselves have no stalk. Small pods are produced, each of which contains one or two small seeds.

Climatic Requirements.—Clustered clover germinates in the autumn but makes little growth until the warm months of early spring. In late spring it goes to seed and dies off when the summer commences. The clover is fairly drought resistant and will develop on a low winter rainfall, though not much feed is produced if the June-August rains are light.

Soils.—On all well-drained soils of fertile character clustered clover can be relied upon to produce some growth in most seasons, but some encouragement in the shape of fertilizer may be necessary to produce worthwhile grazing.

Planting.—Clustered clover merits sowing in native pastures on fertile soils not moist enough to support the better winter and spring growing clovers. Such pastures, after discing or other harrowing, should be improved by the broadcasting of 2 to 3 lb. of clustered clover seed per acre.

Management.—The clover depends for its persistency on self-sowing and though it will set seed under fairly close grazing conditions, it is advisable to encourage seeding by spelling the pasture at the appropriate time.

Feeding Value.—All classes of stock find clustered clover palatable and it makes a nutritious feed.

Subterranean Clover (*Trifolium subterraneum* L.).

Origin and Distribution.—Subterranean clover is a native of Mediterranean regions and western Europe, where it is a weed rather than a significant pasture plant. It was introduced by accident to Australia and its systematic cultivation was first undertaken in South Australia about 30 years ago. It is now extensively used for pasture and soil renovation purposes in Southern Australia and in New Zealand.

Description.—The plant is a hairy annual which produces prostrate stems and erect leaf stalks. Whitish flowers are produced in heads at the ends of short stalks and as the flowers mature many of the heads turn downwards into the ground and bury their seed pods.

Climatic Requirements.—Subterranean clover is a winter-growing plant and requires a fairly heavy late autumn and winter rainfall for its full development. The weather must also be moist and not too hot when the seeds are being formed, otherwise the flowers abort and the plant fails to seed itself down. A precipitation of 12 to 15 inches during the period May-October is required in most instances, and this is seldom realised in Queensland. In addition seasonal conditions in Queensland during August and September usually are unfavourable to seed development.

Soils.—Heavy soils are not favoured by subterranean clover. It prefers light soils of high fertility. In addition to its use for pasture purposes on good soils, subterranean clover is employed as a renovator of worn-out soils or as a pioneer pasture on naturally infertile soils.

Planting.—Seeds of various strains of subterranean clover are available on the market and farmers and graziers desirous of testing the clover under their local conditions are advised to experiment with early, mid-season and late-maturing strains. The seeds can be sown down on well-prepared land, either alone or in admixture with other pasture seeds, or they can be sown on renovated native or sown pastures.

A maximum seeding rate of 5 lb. per acre may be employed. It is essential to employ superphosphate with the seed if it is being sown on phosphate-deficient soils, and seed inoculation may be necessary.

Management.—The young plants should be permitted to develop some lateral branches before being grazed and stock should be removed at the time of seeding. There is some danger of hoven if grazing is not carefully controlled.

Conservation.—A hay of good quality is made from subterranean clover in the Southern States, the crop being cut when commencing to mature.

Feeding Value.—The clover provides, when green, a very luscious and nutritious feed for all classes of livestock and if allowed to cure naturally in the paddock retains much of its palatability and feeding value.

Pests.—The lucerne flea is very destructive of subterranean clover stands in some States, but does not occur in Queensland.

[TO BE CONTINUED.]

* * *

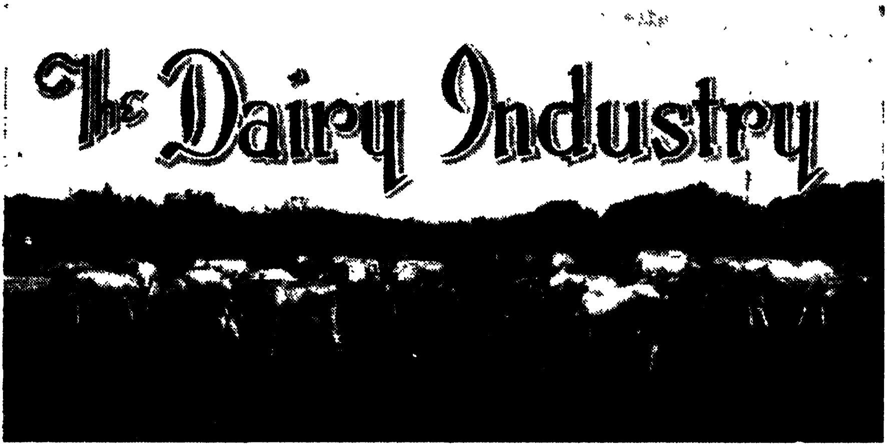
PLANTING OF GRASS CUTTINGS.

Grasses which are propagated commonly by means of stem cuttings, plantlets, or crown divisions, include Kikuyu grass, Para grass, couch grass, elephant grass, and Guinea grass. In special circumstances, the planting of vegetative material of the grasses mentioned may be carried out on rough country and on timbered land with some prospects of successful establishment; but, wherever possible, well-worked land should be provided.

Where stem cuttings are used, these should be cut with a knife, shears, or chaff-cutter into lengths, each containing at least two nodes or joints. If abundant material is available, it is advisable to allow several nodes to each cutting. The cuttings may be laid flat in shallow furrows and covered or placed vertically so that one or more nodes are buried and the remainder are above the surface. The soil should be well firmed about the cuttings. The cuttings shoot and root at the buried nodes and also form shoots at the other joints.

If plantlets or crown pieces are being planted, the best method is to set them out in holes in lines across the paddock. The holes are made with a hoe, the tool being used with its head at right angles to the line. When planting, the planter works along the line, places the plant against the hard far edge of the hole, fills up the hole, and compacts the soil with all his weight on his right foot, while putting in the next plant. To avoid setting the plants too deeply, the tuft should be held from above, but close to the crown, so that the knuckles of the hand are on top of the ground when the plant is being set.

—*C. W. Winders.*



To Cull or Not to Cull.

L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

TO cull or not to cull, that is the question which faces a dairy farmer after receiving the production records of his herd from the official herd tester. Against culling it has been argued that "the cows are only eating grass which costs the farmer nothing," and that other costs are equally inconsequential. Grass, however, is just as much an agricultural crop as wheat, maize, and sugar-cane. It is the crop on which the dairy farmer depends for his livelihood, and the cultivation of grass requires as much attention from him as other farmers give to cultivated crops. The cost of producing the grass crop is by no means small; it includes interest on the capital invested in land, stock, and equipment. The annual cost of pasture management must be added—including renovation of old pastures, fodder conservation, destruction of weeds and pests, the purchase of fertilizers to maintain the fertility of the pastures, cutivation of special fodder crops, and water conservation. Rates and other charges also add their quota to the cost of producing grass in sufficient quantity for the dairy herd.

The cost of milking includes interest on the capital invested in buildings and equipment. The cost of living of all persons engaged in milking must be added, no matter whether they are members of the farmer's family or not. If labour is employed, wages also must be taken into account.

The small amount of fat produced by some unprofitable cows in a herd certainly adds to the farmer's income, but unless the cream returns from them covers the working expenses involved such cows reduce the farmer's net income. As a profit of 5 per cent. is only a reasonable return from any investment, each cow should be required to give at least that rate of profit on her share of the capital invested. As an example of this reasoning the following hypothetical case is submitted:—

Total capital invested in the farm, stock, buildings, and equipment is £2,100; number of cows, 30; total working expenses for the year, £210.

		£	s.	d.
Capital invested per cow	=	70	0	0
Working expenses per cow	=	7	0	0
5 per cent. profit on £70	=	3	10	0
Total return required per cow	=	10	10	0
Weight of fat (at 1s. lb.) to cover expenses	=	140 lb.		
Weight of fat (at 1s. lb.) to cover profit	=	70 lb.		
Minimum fat required from each cow	=	210 lb.		

Cows producing less than 140 lb. of fat a year would not even be paying for their upkeep. As they would thus be responsible for a definite financial loss, they should be culled immediately and replaced either by young stock bred from the higher producing cows or by good cows purchased from a reliable source. Cows producing between 140 and 210 lb. of fat would be paying for their upkeep, but would not be returning the required 5 per cent. profit. They should be culled as opportunity offers of replacing them with better stock. The extra fat produced by the better stock would very soon compensate for any expenditure involved in the replacements, and thereafter would greatly increase the profit.

There is only one answer to the question at the head of this note, and that is: *Cull.*

◆

QUALITY OF DAIRY PRODUCE.

The dairyman should always bear in mind the fact that butter and cheese can be only as good as the milk from which they are manufactured. If milk of an inferior quality is produced, the butter or cheese factory cannot be expected to manufacture a first-class article.

Milk is the normal secretion obtained from the udder of a healthy cow, properly fed and cared for. Milk obtained during fifteen days immediately prior to, and ten days immediately following, calving, should be excluded from the bulk supplies. Milk should contain not less than 3.3 per cent. of milk fat, and must be free from any added water, separated milk, or preservatives.

Milk from cows suffering from mastitis, or any other disease of the udder, should not be used.

Cows should not be allowed to wade in or have access to stagnant water. The flanks should be brushed with a cloth, when the animals come into the bails. Clean water and clean cloths should be used for the purpose of washing the udders and teats prior to milking, and the hands of the milkers should be washed before, and again after, milking each cow.

The first few drops of milk are usually contaminated and, therefore, should be milked into a tin and thrown away after milking. They should not be milked on to the ground, or thrown about the bails where they are liable to attract flies.

Musty feed must not be fed to cows. The animals should not be allowed to graze in paddocks known to contain weeds which will impart a detrimental flavour to milk, nor should they be fed highly flavoured foods immediately before or at the time of milking.

Dairy utensils should be thoroughly cleansed and scalded, then aired and dried in the sun in an inverted position.

Disinfectants, under normal conditions, should not be used in the dairy house or bails.

—*D. A. Logan.*

Hot Weather Ailments in Pigs.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

AS is well known, pigs can stand ordinary extremes of temperature if they are in health; but there are times and occasions when hot weather beats them, especially if they are forced against their will to travel.

Sunstroke and heat apoplexy are ailments which are aggravated by the exposure of the animal to the actual rays of the sun, by over-exertion, and by thirst.

Pigs running in paddocks, and kept ordinarily under open air conditions, are rarely overcome by the effects of heat so long as they are provided with reasonably cool shade; but they cannot stand up to exposure in bare yards where there is no protection and no relief from the heat.

Breeding stock, both boars and sows, of mature age, usually can be relied on to look after themselves and keep out of the sun when it becomes very hot; but young pigs sometimes lie too long in the sun and, as a consequence, suffer severely from sunburn and scald.

These skin ailments are caused by the effects of the sun on the tender, somewhat unprotected skin of the pig.

Treatment for sunscald or sunburn must be preventive as well as curative. The pigs should be housed in clean, comfortable, well-protected sties, or in a well-shaded grassy yard or paddock. If the animals show soreness and are in need of treatment, they should be treated so as to cleanse and heal the skin, and should thereafter be kept under better conditions. The old-time remedy, kerosene and fat, although crude and sometimes effective, is not a reliable skin ointment. Spraying with crude oil or sump oil is usually preferred.

During and after treatment, the pigs should be given sound, nourishing foods, plenty of greenstuff, clean drinking water and essential minerals. Shade trees—such as weeping willow, pepperina, native figs, and phytolaccas—or upright growing shrubs like Buddleia—are recommended. Where skin trouble in pigs is aggravated by the presence of parasites like lice, sandflies, mosquitoes, fleas, or flies, the hair will also become affected. There may be a scurfiness of the skin indicating an unhealthy condition and a deep subcutaneous penetration of the burn or scald. In very severe cases, partial paralysis and a rickety condition may become evident. The animal suffers great pain, and may even lose the use of its hindquarters, particularly in the case of young pigs weakened by improper care and unbalanced rations.

Any animal showing signs of illness during hot weather should be immediately isolated and given proper treatment. In addition to skin treatment, affected animals should be fed on very light nourishing foods. Occasional doses of epsom salts will also be beneficial, and may be administered in the food.

Sunscald, sunstroke, heat-stroke and heat apoplexy are similar in their effect on the animals; sunstroke is due to exposure to the direct rays of the sun; heat-stroke is due to intense heat, even though the animal may be protected from the direct sun rays; heat apoplexy follows exposure and exhaustion during hot weather.

In each case very fat animals suffer most, especially if they are exercised too freely or are compelled to travel during the heat of the day, or are forced along too rapidly during muggy weather. Exposure to heat, even without exercise, is dangerous. Many valuable pigs have been lost through being shut up in hot, dry yards without any shade, water, or protection from the heat.

It is unwise to overfatten pigs in hot climates—it also is uneconomical, especially as no payable demand exists for fat pork or bacon. It is equally disastrous to keep breeding and growing pigs in an overfat condition. Pigs in sties may suffer very greatly from heat, because of bad ventilation, or unsuitable accommodation.

Many pigs die of heat apoplexy en route to market or factory. In some cases the animals are overheated before being trucked, and this, together with consequent excitement and fatigue and the absence of cool drinking water, leads to fatal results. To pen pigs in comparatively cool, shady pens, and then suddenly expose them to heat and severe exercise during a journey is to invite trouble. An overheated pig will lie down and lose control of its movements. The first indication is usually an unsteady gait and dullness. The pig may show no other indication of illness, but may just fall over and become unconscious.

In these cases, the animal's breathing is usually much more laboured than normal, even though it may appear very faint. The ears are invariably hot and droop loosely. The eyes are dull and the nose is hot and dry. The animal appears to lose control of its movements; the head hangs limply and the body sways to and fro. As the trouble advances, trembling of the muscles, followed by convulsions, may also be observed. The bodily temperature increases and the animal gasps for breath. The course of this disease may be very short and the animal may die in a few minutes after the illness first manifests itself.

In other cases—as when animals are loaded into pig wagons in an overheated condition—the pigs may live for several hours.

A good clean water bath in some convenient shady place is an excellent thing for pigs in hot weather. If provision can be made to enable the pigs to cool off for an hour or two before trucking, and for a good water supply, many valuable animals may be saved. A properly constructed concrete wallow or bath is preferable to a mud bath.

One sometimes notices a farmer carting his pigs on a hot day in a small cart or wagon quite unprotected except for a few green bushes over a wire netting frame work. The provision of a suitable cover for pigs, such as would allow for a current of cool air and protection from the sun, would soon repay its cost, and add considerably to the comfort and satisfactory transit of the pigs. If trucking must be done in very hot weather, the pigs should be delivered to the station early in the morning, and should be allowed time to cool off. They should, of course, have ample drinking water before starting on the road.

If treatment is necessary the animal should be placed in the shade and cold water or a cold water pack (wet bagging) be applied to the snout, face, and then the head. The treatment must be persisted in for several hours in severe cases, after which the animal should be compelled to take light exercise.

A change to a very light nourishing diet is advised when once the animal has been placed in a suitable pen or yard with plenty of shade and protection, as it will take affected animals several weeks to get back to normal again. No attempt should be made to send them to the factory until they have quite recovered from the attack.

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BRANDING OF PIGS.

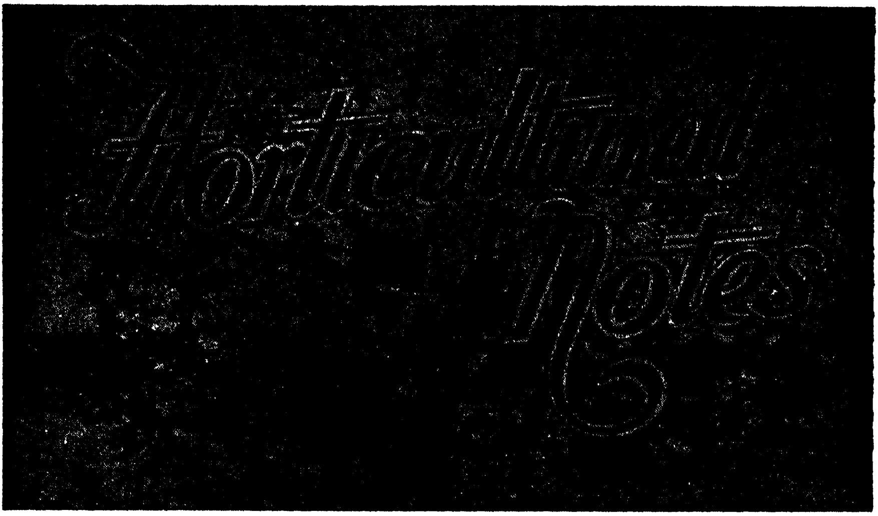
Under the Queensland Pig Industry Act, the identification of all pigs sold, offered for sale, barter, or exchange, is compulsory. This is essential to satisfactory marketing of this class of stock, and where marking is carried out as a regular routine job, presents little difficulty. Identification facilitates investigation into disease, whether epidemic or otherwise.

The Act provides particularly for the marking of all pigs consigned to factories, and there has been widespread appreciation of its value. There may be differences of opinion in regard to the advantages of various systems of identification; but from a factory point of view it is a very great advantage to have the carcases plainly identified.

Exporters prefer the body tattoo as a means of identification, and bacon-curers almost without exception are more than satisfied if the carcases are tattooed efficiently. The use of the firebrand is being superseded generally by the more efficient method of tattooing, in which a body-tattooing instrument and marking paste or ink are used.

The marking of sucker, weaner, and store pigs presents greater difficulty, because neither the body tatoo nor the firebrand are sufficiently permanent where the pigs are to be retained on the farm for periods varying from two to five months. In the case of these young pigs, two systems are especially adaptable viz., earmarking and ear-tattooing, the latter being suitable only in the case of white or red coloured pigs.

The departmental pamphlet, "Identification of Pigs," is available free on application to the Department of Agriculture and Stock, Brisbane.



Possible Substitutes for Lead Arsenate in the Control of Codling Moth.

HUBERT JARVIS, Research Officer.

FOR a considerable time lead arsenate has been the most widely used insecticide for the control of the codling moth in deciduous orchards. Although reasonably effective, a spray schedule based on lead arsenate has some disadvantages; residues greater than the tolerance limits permitted may accumulate on the fruit, and the vigour of the trees may be affected adversely. A considerable amount of attention has therefore been given to the study of non-arsenical substitutes during recent years.

Experiments at Stanthorpe during the 1935-36 season indicated that a number of possible substitutes, including potash soft soap, colloidal sulphur—potash soft soap, nicotine sulphate—white oil and colloidal sulphur—nicotine sulphate may be just as effective as lead arsenate for the control of codling moth. With the exception of potash soft soap, spraying costs are much higher, and it is improbable that these sprays will, in practice, replace lead arsenate for specifically codling moth control purposes. Potash soft soap, however, compared favourably with lead arsenate in both efficiency and costs, and some comments on this insecticide are therefore necessary.

Potash soft soap is readily prepared, and at the experimental strength of 10 lb. to 80 gallons of water has no harmful effects on the trees. Colloidal sulphur can be added when necessary to form a combined spray which should control not only the codling moth, but also powdery mildew which is frequently troublesome. Experimental trees were free from "scorch," which so often appears in orchards treated with lead arsenate—particularly during the harvesting period.

Potash soft soap may therefore be of some value, but a great deal more work is necessary before the grower can regard it as a reliable substitute for lead arsenate. Experimental results always require confirmation on a large scale before any existing practices can be safely modified. The current year's experiments at Stanthorpe are accordingly designed to check the accuracy of the results already available, as well as to investigate the insecticidal properties of potash soft soap in detail. The practicability of timing spray applications more accurately by observations on moth activity will also be studied. Alterations of standard practices may or may not then be advocated.

In the meantime, orchardists may wish to use a little potash soft soap on their own trees during the coming year for personal observations. Under these conditions, a small group of trees may be given the complete potash soft soap schedule, adding colloidal sulphur when necessary for the control of powdery mildew, the balance of the orchard receiving the customary treatment. If the moths are very numerous, growers should adhere strictly to the ordinary spray programme on the orchard, rather than risk losses by using an alternative spray, such as potash soft soap, the value of which requires further investigation.

◆

THE PLANTING OF BANANAS.

The best aspect for banana-growing is one varying from easterly to northerly, and even north-westerly, provided that the plantation is well sheltered from strong winds. As southerly slopes are usually cold, banana plants, if grown on them, develop slowly, and the fruit is generally inferior—hence land with a southerly aspect is not worth considering if other land is available.

Logging and hoeing operations should, if possible, be followed by a thorough grubbing. Grubbing is particularly advisable if the plantation is being established in forest soil. It is necessary for the aeration and drainage of the soil, and the maintenance of a supply of moisture for the plants. Many growers look askance at forest soils for bananas, but plantations on such soils, if worked thoroughly and desuckered carefully, can produce fruit of first-class size and quality.

As a result of the recent rains, it is now possible to plant bananas in many localities in which, hitherto, the protracted dry weather had been against a successful setting. If bits or butts are being utilised, careful attention must be paid to baiting for the banana weevil borer to ensure the planting of clean material. Growers in need of advice on the selection and preparation of planting material should get in touch with the nearest fruit inspector or banana agent.

Holes for planting should be, roughly, about 15 inches square by 15 inches deep. The surface soil from the top side should be raked back into the hole and the sucker placed in the loose soil and tramped firmly all round. The top of the sucker need only be covered lightly with loose earth, and the hole should not be refilled completely.

An application of about ½ lb. of fertilizer when planting will hasten and strengthen the growth of the young plants. The actual time of planting will depend on the conditions in the different districts. On a slow-growing aspect, October planting is best, while on warmer slopes November and December may be more suitable.

Where grubbing has not been done previously a circle around each plant with a radius of approximately 3 feet should be grubbed. This gives the plant both sufficient sunlight and freedom from smothering weeds. Planting 10 feet by 10 feet is a good average distance, but 12 feet by 12 feet is preferred by many growers.

The best method of spacing followers is that known as "one bunch one follower." This enables the grower to regulate and handle his fruit cutting and packing with convenience, as it is more or less confined to the winter months. For about the first twelve months after planting, all but one or two followers should be kept back, and thus all energy is directed into one plant and its bunch. The folly of allowing as many suckers as may appear to develop cannot be condemned too strongly.

—*J. Freeman.*

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

NEW season's cherries, apricots, and China Flat peaches are on sale, heralding the early approach of all types of stone fruits.

The following were the prevailing prices at the end of October:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Nines, 18s. to 19s. 6d. per case; eights, 13s. to 18s. 6d.; sevens, 11s. to 18s.; sixes, 9s. to 15s.; smalls, 6s. to 14s.; Lady Fingers, 4½d. to 11d. per dozen.

Sydney.—Eights and nines, 22s. to 25s. per case; sevens, 18s. to 22s.; sixes, 15s. to 18s.

Melbourne.—Nines, to 22s. per case; eights, to 20s.; sevens, 18s. to 20s.; sixes, 16s. to 17s.

Adelaide.—23s. to 24s. per case.

Pineapples.

Brisbane—Smooths, 6s. to 8s. 6d. per case; 2s. to 8s. per dozen. Ripleys, 9s. to 11s. per case; 1s. 6d. to 7s. per dozen.

Sydney.—Smooths, 9s. to 12s. per case.

Melbourne.—Smooths, 8s. to 12s., with some specials up to 14s., per case.

Adelaide.—16s. to 17s.

Papaws.

Brisbane.—Yarwun, 7s. to 10s. a tropical case; Local, 4s. to 5s. a bushel case; Gunalda, 5s. to 6s. a bushel case; inferior lines lower.

Sydney.—9s. to 12s. a tropical case.

Some lines are arriving specky, and it would be to their advantage for a better selection of firm types to be used.

Melbourne.—10s. to 14s. a tropical case.

Mangoes.

Brisbane.—Well-packed lines, 7s. to 8s. per bushel case; bruised lines lower and hard of sale.

Sydney and Melbourne.—Only good types of mangoes should be sent to these markets.

Passion Fruit.

Brisbane.—First grade, 10s. to 13s. per half-bushel; second, 6s. to 9s.

Sydney.—7s. to 10s. per half-bushel.

Melbourne.—9s. to 18s. half-bushel.

Strawberries.

The present crop is now practically finished. Few first-grade berries are now to be seen. The advent of new season's stone fruits will decrease the demand for strawberries; so only first-grade fruit should now be marketed.

CITRUS FRUITS.

Oranges.

Brisbane.—6s. to 8s. per case; specials, 9s. to 10s. 6d. per case; second crop, 3s. to 5s.

Second-crop fruit is extremely hard of sale, only well-coloured lines being saleable.

Sydney.—Valencias, 5s. to 8s. per bushel.

Melbourne.—Navels, 4s. to 9s. per bushel; Valencias, 4s. to 9s.

Grape Fruit.

Brisbane.—4s. to 9s. per bushel.

Sydney.—4s. to 10s. per bushel.

Melbourne.—7s. to 16s. per bushel.

Lemons.

Brisbane.—Gayndah, 6s. to 12s. per bushel; Benyenda, 14s. to 15s.; locals, 3s. to 8s.

Sydney.—2s. to 5s. per bushel.

Melbourne.—4s. to 8s. per bushel.

OTHER FRUITS.

Apples.

Brisbane.—Jonathan, 6s. to 10s. per case; Granny Smith, 5s. to 9s.; Sturmer, 4s. to 7s.; Crabs, 6s. to 7s.; Delicious, 9s. to 10s. 6d.; Democrat, 5s. to 8s.; Crofton, 7s. to 10s.; Yates, 5s. to 9s.

With the exception of Yates variety, all others are giving a lot of trouble in becoming specky. Only selected fruit should now be sent to Brisbane.

Pears.

Brisbane.—Coles, 10s. to 13s.; specials to 16s.; Winter Nelis, 9s. to 15s.; Josephine, 10s. to 15.

Some lines specky and hard of sale.

Cherries.

Brisbane.—7s. to 10s. a 12-lb. box; specials higher.

China Flat Peaches.

Brisbane.—2s. to 4s. per tray.

Cape Gooseberries.

Brisbane.—6d. to 6½d. per lb.

Tomatoes.

Brisbane.—Ripe, 1s. to 3s. half-bushel; green, 2s. to 3s.; coloured, 3s. to 4s. 6d.; specials higher.

Sydney.—Queensland tomatoes, 2s. to 5s. per half-bushel.

Melbourne.—Adelaide hothouse, to 18s.; Western Australian, 6s. to 14s.

VEGETABLES.

Beans.

Brisbane.—5s. to 6s. sugar-bag.

Melbourne.—To 16s. per 50-lb. bag.

Peas.

Brisbane.—5s. to 6s. bag.

Lettuce.

Brisbane.—1s. to 2s. per doz.

Cucumbers.

Brisbane.—3s. to 5s. a bushel.

Sydney.—6s. 6d. to 10s. a bushel.

Melbourne.—5s. to 7s. a bushel.

PUBLICATIONS.

"Strawberry Packing," "Passion Fruit Marketing," and "Peach Packing" are now available for distribution. "Tomato Packing" is now in the hands of the printer, and should be available for distribution later in the month.

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SOWING TOBACCO SEED.

Owing to its minute size, special care has to be taken in the sowing of tobacco seed. The method followed most generally is to mix it with some solid distributing medium, such as wood-ashes, and to apply the mixture to the prepared seed-bed.

Another method, which has much to commend it, is to apply a suspension of tobacco seed and water to the bed by means of a watering can. Advantages claimed for this method are that the process of mixing the seed with the distributing medium is quicker and less troublesome than the other method, and furthermore it can be used in windy weather quite satisfactorily. The momentum of the falling drops furthermore tends to partly embed the seed in the soil.

The procedure for watering-in is as follows:—Half fill a watering can with water, measure out the requisite quantity of seed, and mix thoroughly with the water, then pour in the rest of the water to nearly fill the can, and again stir. It will be seen that the seed remains in suspension, evenly distributed throughout the volume of water. The water then should be quickly and evenly distributed over the surface of the bed. This is easier if the surface crust of the bed is dry, when the ground covered can be the more readily distinguished.

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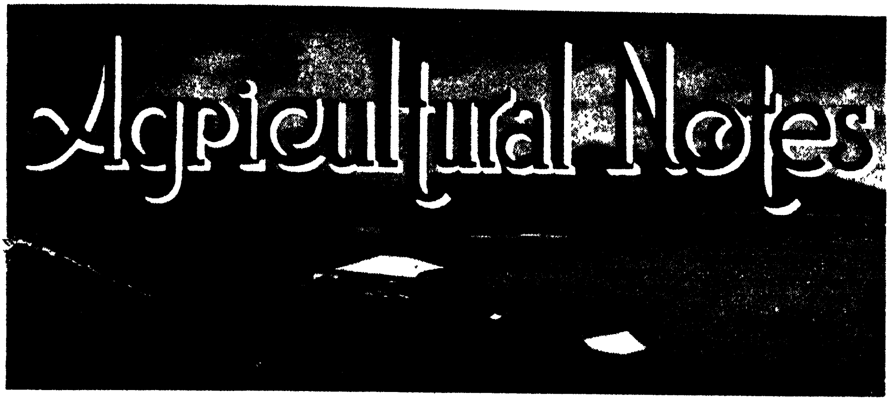

First Steps in Irrigation Practice.

H. W. KERR.*

INTRODUCTION.

IT is pleasing to record the sustained interest in the value of irrigation practice, as an aid to reduced production costs; this is evident in most cane areas of Queensland, with the exception of the humid belt from Tully to Babinda. Doubtless irrigation is also the greatest single force capable of conferring stability and certainty in those areas where rainfall deficiency and distribution are the major factors in limiting acreage yields. The best example of what may be achieved by wide-scale irrigation is the Lower Burdekin area. During recent years great strides have been made in the more economical application of water and the judicious use of appropriate manures; the result has been to raise the average sugar yield per acre, over the three mill areas, to almost 5 tons of sugar per acre.

In response to numerous requests, the following notes have been prepared to serve as a guide to those farmers who, with limited funds, are desirous of searching for and developing water resources chiefly through their personal efforts, so as to minimise costs of investigations and installation. It is hoped that the relevant data provided may prove useful, though it should be stressed that these notes are necessarily general in character, and specific advice should be requested where any special features are involved.

WATER SUPPLY.

The first consideration is, of course, the availability of adequate, good-quality water. This may be obtained from either open streams or subterranean sources. In point of fact, there is essentially no difference between these seemingly widely separated sources. In each case a stream of water is involved; whereas the former is flowing in an existing "natural" water course, the subterranean stream actually follows a pre-existing course which has since become overlaid by sediments or other deposits so that its existence is no longer obvious, but along which underground streams are still able to flow. The major difference is, of course, that careful search is required to locate the latter; but it is rather significant that Queensland practice demonstrates a generally greater degree of reliability and permanence than can be claimed for open streams, notably in the drier areas of the State.

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* In the "Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations, Queensland) for October, 1937.

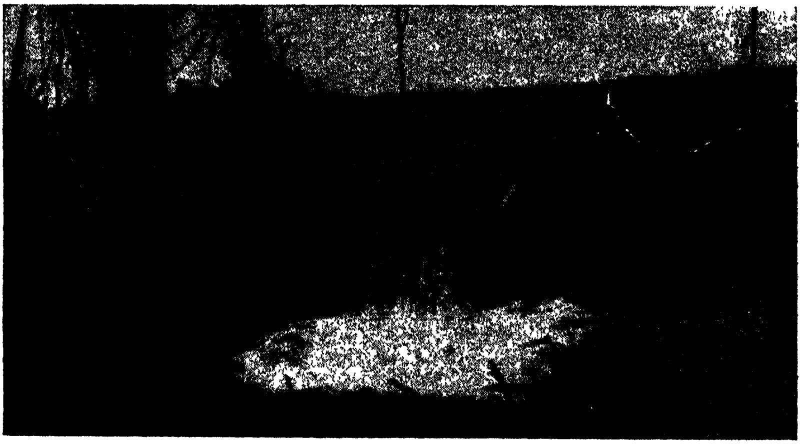


Plate 244.
Delivery of water from flume to main ditch.

The location of underground water is a subject for controversy which revolves around the claims advanced in support of some occult power, alleged to be possessed by certain individuals, in detecting the existence of subterranean water—so-called "divining." The writer has no desire to become involved in any discussion on this topic, and doubtless nothing that might be advanced for or against would influence farmers in their attitude towards the diviner and his work. Suffice it to say that the location of probable sites at which water-bearing strata will be encountered is largely a matter of "hit and miss" methods. Where any extensive borings have been made in an area, it is possible to formulate general principles which will indicate whether the site selected offers prospects of success. The only sure method of testing any probable site is by boring. In soft strata, the use of a posthole digger, and later, the sand pump, may enable a bore to be driven in a fairly simple and rapid manner. But where compact rock strata are encountered, the use of a boring outfit is necessary. Naturally the cost of boring will be governed by the nature of the strata and the depth at which water is encountered.

QUALITY OF WATER.

One of the first considerations, when a water supply is located, is to determine the quality of the water. It is always desirable to have a test made by a competent analyst, whether the water be drawn from an open stream or an underground supply. For this purpose, a representative sample of about a pint should be transferred to a clean bottle, and despatched to the nearest Sugar Experiment Station, or the Head Office of the Bureau, where an analysis will be made and an opinion given free of charge to all canegrowers. With subterranean supplies, the sample should be taken after pumping for a time to assure that the sample is truly typical of the supply and is not the result of surface seepage.

Many natural waters are too salty for irrigation purposes, while others contain harmful amounts of substances such as carbonate of soda, which act as "poisons" to crops. This simple precaution of chemical test is always worthwhile, and might save much worthless expenditure on plant and installation. The limiting concentrations of undesirable salts cannot be formulated without reference to the soil type on which the water will be used, and to the presence or absence of other compounds in the water, which may act as correctives.

TESTING CAPACITY OF SUPPLY.

It is next important to determine the capacity of the available supply. Where an open stream is to be drawn on, this is a relatively simple matter. For large streams, records are generally available, from gaugings, and these will indicate the capacity of the river or creek with the necessary degree of accuracy. It is well recognised that open streams vary in flow, being usually at a minimum in the spring and early summer months. As it is at this season of the year that the greatest demands are made by the cane crops, the farmer should assure himself that the flow (or flow plus possible storage) is capable of supplying the full demands of the plant which he proposes to install. This is especially important with creeks of limited capacity. For such streams it may be necessary to arrange for a measuring weir to be installed, and careful and systematic flow records kept. To provide some idea of the flow required to supply the needs of centrifugal pumps of varying size, the following table is presented as a useful guide:—

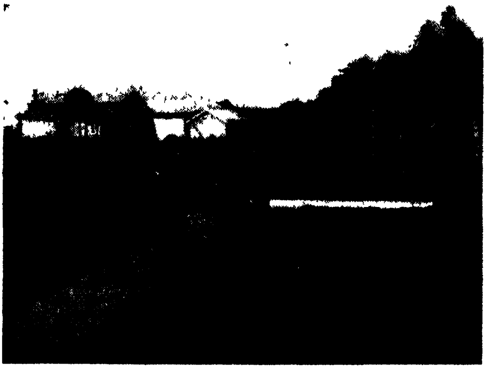
Diameter of Pump. Inches.	Capacity per hour. Gallons.
3	9,000
4	16,000
5	24,000
6	33,000
7	45,000

Where the minimum flow does not permit of the desired pump size, the possibilities of damming the stream to provide night storage for daylight pumping, should be carefully investigated. It should be noted that, before a farmer is permitted to draw on open streams for irrigation purposes, application must first be made to the Department of Irrigation and Water Supply, which will advise him of the formalities to be complied with.

As a guide to the number of acres which might be watered satisfactorily with a given supply, it is safe to assume that this will be equal to the number of thousands of gallons which the pump will deliver per hour. Thus, for a 7 inch pump delivering 45,000 gallons per hour, an area of 45 acres may be watered adequately, when the pump is operated for ten hours per day, approximately 100 days per year.

The testing of underground supplies is not so simple. Some indication may be gained by a pumping test on a bore which has been driven into the water-bearing stratum. When boring, it is customary to operate the auger, sand pump, etc., inside a steel casing somewhat larger in cross sectional area than the tool which is employed. By applying weights or force to the casing, it is driven downwards as the soil or sand is removed from within. Successive lengths of casing are attached to enable it to extend to the water-bearing stratum; for preference, the casing should be lowered to the *bottom* of this layer. For the pumping test, a "spear" attached to a suitable suction pipe is then lowered within the casing, and attached to a pump. The spear consists of a cylinder of gauze which serves to admit the water while excluding the sand. Modern spears are now manufactured as variations of the earlier type, but they perform essentially the same task with greater or less efficiency.

The nature of the test pumping unit is a matter for consideration. A centrifugal or other form of suction pump cannot be operated unless located at not more than 25 feet above the water level; the level will, of course, also be lowered during the progress of the trial.



Main or feeder ditch.

Furrow irrigation from main ditch.

Plate 245.

Naturally, the capacity of a single bore may not provide a true reflex of the full capacity of the water beds. A number of factors enter to complicate the problem. If the water-bearing stratum, or "drift" as it is called, is of very coarse sand or gravel, it will offer little resistance to the free passage of water, and it may be possible to draw a large supply from a single bore. On the other hand, a fine sand drift may yield water at a relatively slow rate, yet with a series of spears, each suitably located, and jointed to one central suction pipe, it may supply over 100,000 gallons of water per hour. These questions require careful study and test in order that the true capabilities of the site may be gauged. Of course, expert advice is very helpful and necessary in reaching a reliable conclusion in these matters.

SELECTION AND INSTALLATION OF PUMPING UNIT.

Having established the existence of an ample and accessible water supply, the next considerations are what it will cost to deliver water to the field, and what will be the most economical unit to install for pumping; the latter question involves (*a*) cost of installation, and (*b*) operating and maintenance cost.

The cost of pumping will be directly related to the height to which the water must be raised. Thus it will require four times the power to raise a given quantity of water 100 feet, as it will to raise it 25 feet. To determine the total "head," as it is called, one must determine the difference in height between the water in the drift, *when the pump is operating,* and the point of emergence of the water from the delivery pipe. In addition, it is necessary to make allowance for the friction loss due to the passage of water through the spears and pipe line. It is customary to provide a suction and delivery pipe about 1 inch greater in diameter than the intake and outlet of the pump respectively, to avoid any serious loss from the lastnamed cause. However, if water must be raised a considerable height through heavy gauge piping, the increased diameter may add appreciably to the installation cost. The friction loss at the spear will be governed by the type of drift.

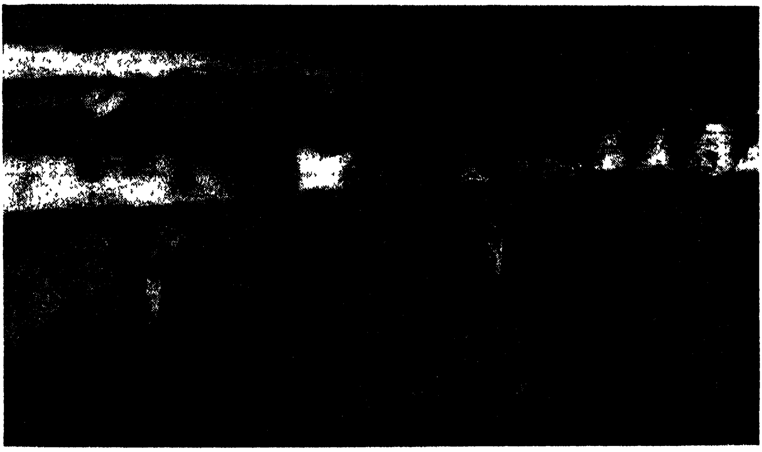


Plate 246.

Illustrating tube method of delivery of water from feeder ditch to furrows. The flow of water may be controlled by adjusting the level of the galvanised iron tubes.

When the total head against which the pump must operate is known, it is possible to calculate the approximate engine power necessary to take care of the desired volume of water. This figure will naturally be governed by the efficiency of the pump. Though the modern centrifugal pump has been developed to a high state of efficiency, it is most important that the speed at which it is operated be carefully checked to ensure the maximum pumping efficiency. That is to say, there is definite speed at which the pump will deliver water at a minimum cost per gallon; for speeds above or below this figure, the *actual* water delivery will be raised or lowered, but at the same time the cost per gallon will be invariably increased. The best speed will also depend upon the pumping head, and the guidance of a reputable irrigation supply firm should be sought in the selection of the most suitable unit for a given job.

Wherever practicable, it is desirable to install a horizontal centrifugal pump, operated by belt drive from the engine. As was indicated earlier, the pump must not be more than 25 feet above the level of the water, or it will not draw its supply. For preference, the pump should be placed as close as possible to the water bed. Where the water-bearing drift is, say, 30 feet below the land surface, a pit or well may be scouped or dug to a suitable depth, and the pump installed therein. The engine may then be placed at normal land level.

For deep supplies, the vertical spindle centrifugal pump becomes necessary. As the excessively long shafting required for this purpose demands adequate bearings, to assure true running, the heavy channel iron supporting frame for such a layout adds considerably to the installation cost. However, it is essential for efficient working with deep supplies of underground water.

A so-called "one-stage" centrifugal pump is satisfactory provided the total pumping head does not exceed, say, 100 feet. With greater heads, the efficiency of the pump falls off at such a rapid rate that a two- or three-stage unit should be employed. Naturally, this will increase the installation cost to some extent, but it makes for reduced costs of operation.

To provide some indication of the manner in which the pumping costs per million gallons of water will vary with variation in the pumping head, the following examples are given. In each case a pump supplying 50,000 gallons of water is stipulated:—

Overall Head.	Nature of Pump.	Pump Speed.	Engine Power Required.
Feet. 25	Single stage-low head	Revolutions per Minute. 1,230	Horse Power. 11·5 net.
50	Single stage-low head	1,480	19·0 net.
100	Single stage-high head	1,550	38·0 net.
200	Two stage-high head	1,550	76·0 net.

In making these calculations, allowance has *not* been made for the power transmission loss, which is often very considerable with an inefficient belt drive. Direct coupling of the pump to engine eliminates this loss, but is seldom practicable.

The selection of a suitable power unit offers considerable scope. Four types are commonly employed—(*a*) steam, (*b*) suction gas, (*c*) internal combustion oil engine, or (*d*) electric motor. The older units were almost all steam operated; then came the era of the suction gas engine, where an abundance of suitable firewood was available. More recently petrol and kerosene internal combustion engines were introduced, while the latest types are almost exclusively so-called "diesel" engines, which operate on crude oil. The last-named type has practically superseded all others. Occasionally, electrical power is employed, either from general service mains or from a central installation employing, say, crude oil or coal to generate electricity, which may be used to operate at will any or all of a number of pumps suitably located over the area to be watered.

It is reasonable to dismiss consideration of steam units in laying down a modern plant. Suction gas may warrant attention in particularly favourable circumstances, but, like steam, it demands the continuous attendance of an operator, which adds substantially to pumping costs.

The internal combustion oil engine—and notably the crude oil type—does not suffer from this handicap. While it must not be assumed that an engine of this class may be allowed to run unattended, it is true that intermittent supervision only is demanded, and the operator may devote attention to other duties as well. At the present cost of crude oil, and with the high efficiency of this type of engine, a maximum fuel cost of ⅓d. per horse power per hour may be assumed.

The power of the engine required must also be considered carefully. While it is obviously unwise to attempt to overload the engine, it is not good business to over-capitalise the plant by installing an unduly high-powered unit. Expert advice is most helpful in arriving at a satisfactory decision; however, the following formula will provide the farmer with a fair estimate of power of a suitable engine, making due allowance for transmission and friction losses and overload margin:—

$$\text{H.P. required} = \frac{\text{Total head (suction, delivery and friction), in feet} \times \text{gallons of water per hour.}}{100{,}000}$$

That is, multiply the vertical distance in feet, from the water-level to the highest point of the delivery pipe, plus an allowance for friction losses, by the estimated volume of water the pump will deliver hourly, and divided by 100,000.

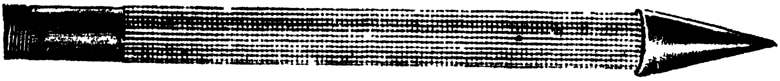


Plate 247.
An irrigation spear.

It has already been observed that the pump speed is very important, and care must be taken to select suitably sized belt pulleys for engine and pump to give the desired revolutions.

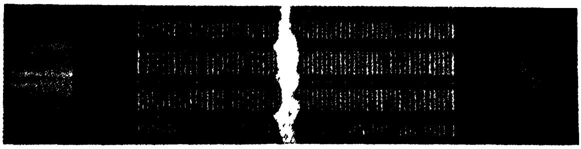


Plate 248.
New type of slotted spear.

Where water is drawn from an open supply, it is only necessary to provide that the suction opening has access to an adequate depth of sand-free water, and to assure that it is not drawing air. Where an underground drift is tapped, care must be taken to ensure complete separation of all sand or gravel from the water entering the pump. The selection of suitable parts for the spear system is therefore of importance. It is found that, where the drift is of medium or fine sand, the rate of passage of water to the spear is relatively slow, and it is then desirable to connect a number of 3-inch spears to a common suction pump. With coarse sand or gravelly drift, fewer large-sized spears (6 inches) are a distinct advantage; they are simpler to install and also less costly and troublesome to maintain. The accompanying illustration indicates the manner in which the spear system is spread out, to assure that a volume of drift is tapped, adequate for the full water requirements of the pump. Though there is nothing particularly difficult in installing a spear system, there are certain well recognised principles which must be observed for successful operation, and the grower would be well advised to seek expert guidance in this regard.

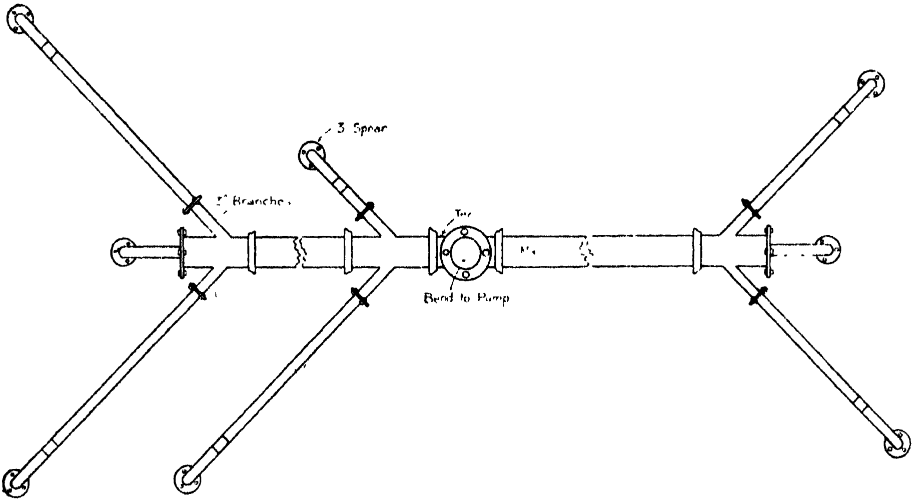


Plate 249.
Typical arrangement of a spear system.

Wells are sometimes employed to provide the source of supply to the pump. In general, these do not have a high capacity unless combined with a spear system radiating outwards from the bottom of the well. However, it is frequently possible to obtain at least a 4-inch pump supply from open water in this way; such a unit is working successfully at the Mackay Sugar Experiment Station. The dry, upper portion of this well is lined with corrugated galvanised iron, in the form of a cylinder; when the water-bearing stratum was encountered, a brick lining was employed, and this was built up as the water-bearing sand was removed and the brick ring subsided. During the sinking of a well of this nature it is necessary to pump out the water at the same rate as that at which it enters; a centrifugal pump, the speed of which can be varied as required is desirable in this connection

ECONOMICS OF PUMPING.

The grower will naturally be highly interested in determining what expenditure it is economical to incur in delivering the water to his crop. Over-all costs (allowing fully for interest and redemption on the installation and maintenance and running costs) vary very considerably. In certain favoured areas water may be obtained for a total cost as low as 22s. 6d. per million gallons. In general, it will be considerably higher.

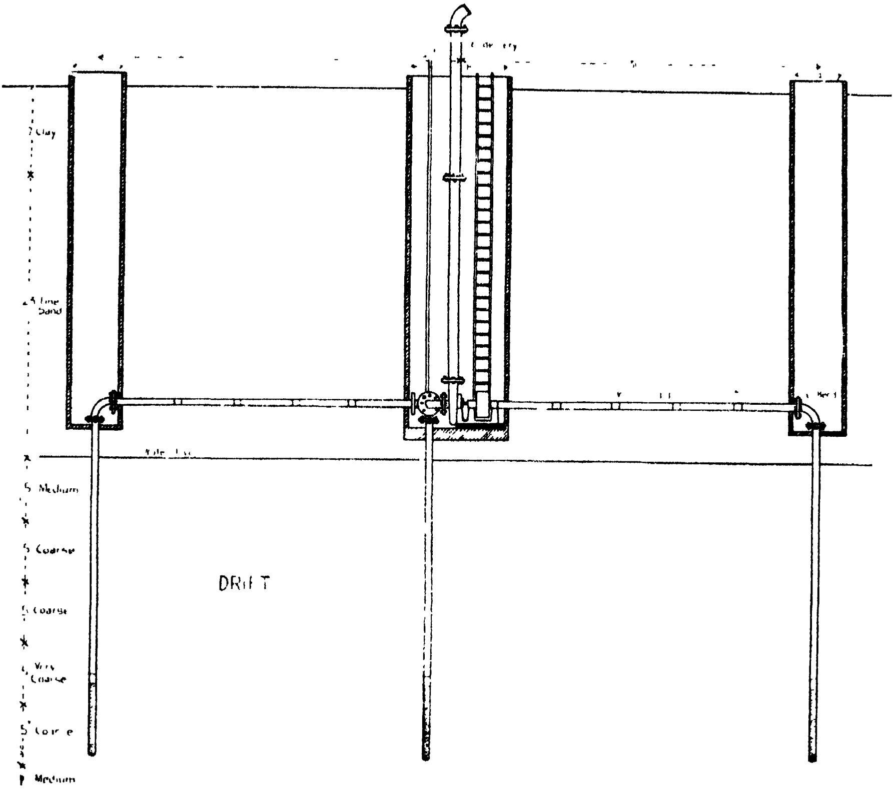


Plate 250.
Illustrating use of concrete lined wells for deep spear installations.

The farmer may take it as a safe guide that, provided he is able to finance the layout, water costs not exceeding £5 per million gallons will prove highly economical, particularly in the drier areas of the State.

* * *

FEEDING OF CONCENTRATES.

Farmers are often averse from feeding concentrates, which impart a flavour or "taint" to the butterfat. Peanut products are a typical example. In many cases the difficulty may be overcome by feeding the material immediately after milking. The animal then is assured of sufficient time, before the next milking, in which it can utilise the constituents which give the off flavour.

The Growing of Cowpeas.

L. HODGE, Biloela Research Station.

THE cowpea should undoubtedly be grown much more extensively—as a cash crop for seed, a grazing crop for stock, and for green manure —by Central Queensland farmers than it is at present.

It is a summer annual related more closely to the bean than the pea, and while it thrives best under warm, moist, conditions, it grows satisfactorily in the inland agricultural districts and during dry weather, provided that it is warm enough. In addition, this accommodating plant does well on poor soils and is thus useful for enriching them, as it is a supplier of nitrogen.

Cowpeas should be sown from mid-November to mid-December to get the best results. The rates of sowing are very elastic, depending on the nature of the soil, the rainfall, and the purpose for which the crop is required. The sowing may vary from 10 to 12 lb. of seed to the acre, according to variety.

If grown for seed, it is recommended that it be planted in rows 2 feet 3 inches apart at a rate of 12 to 14 lb. to the acre, and from 2 to 2½ inches deep. Seed yields of from 15 to 20 bushels an acre may be obtained under moderately good conditions. The seed can be either harvested and sold—it usually commands a good price (15s. to 20s. per bushel)—or fed in the field to pigs, in conjunction with other foods. A variety grown for seed should be one of the kinds which have been especially developed for seed production, as against vine production. The black cowpea is a good type, but others—such as Poona, Groit, and Brabham—are now gaining favour.

The cowpea is an excellent crop for grazing, especially for soils and districts where lucerne does not flourish. Having a high protein content, it supplies the necessary balance to the crops of low protein content—such as Sudan grass and other fodders of that type—and thus enables the farmer to provide feed of a proper nutrient ratio for his stock.

As a grazing crop, the best results—unless rainfall is abundant—are obtained by planting in rows 2 feet 3 inches apart and cultivating once or twice. The crop will be ready for grazing in 50 days or so, and yields of from 12 to 14 tons an acre of green fodder may be produced in 70 days, under good growing conditions. Many varieties suitable for grazing are available, but Victor cowpea has yielded the heaviest growths in the shortest time at the Biloela Cotton Research Station, producing over 15 tons green weight to the acre in 70 days.

As a green manure crop, cowpeas are valuable for orchards, or general farm rotation—their deep rooting, and nitrogen-fixing habits making them especially suitable for this purpose. Such a planting may be broadcast or sown through a grain drill, and will require 15 to 20 lb. of seed to the acre.

In rotations, the cowpea is an excellent predecessor to a cereal, and is recommended to the notice of dairymen who are growing winter wheat or oats for their cows. It should not precede cotton, however, as the nitrate stimulus which follows induces a rank growth of the cotton plant that usually results in a reduced yield.

Menace of Standover Cotton.

A. NAGLE, Senior Instructor in Cotton Culture.

THE soundness of the grassland-cotton rotational method has been demonstrated amply during the past season. As a consequence many farmers in the main cotton-growing areas are planting the whole or part of their acreage of cotton on newly-broken grassland, and intend planting the old cottonfields with Rhodes grass. It seems probable, however, that many old cottonfields that have not already been planted to Rhodes grass will be left for some time as standover cotton.

Experience has demonstrated beyond all doubt that standover fields, through the prolific weed growth associated with them during the spring and summer months, are breeding centres for some of the major cotton pests, such as cutworm and corn ear worm. That being so, they unquestionably are a menace to adjacent fields of growing cotton.

Over a series of years there have been recorded migrations of cutworms, and during the 1934-35 and 1935-36 seasons migrations of corn ear worm, from weedy standover fields to nearby seedling cotton, which have caused substantial loss of stand. The weed growth is also responsible for a big increase in corn ear worm population during January and February, and heavy loss of squares and bolls in crops adjacent to a weedy standover field has occurred even in seasons of generally moderate corn ear worm attack. It is thus imperative that the grassing of standover fields be effected as soon as practicable, to eliminate completely the danger associated with weed growth adjacent to the new cotton.

Although fair stands of Rhodes grass have been obtained occasionally by sowing the seed between the rows of old cotton stalks of the "standover" field during February and March, this practice is not recommended, as more often a thin scattered stand results, and this is insufficient to smother weed growth. The growth made by Rhodes grass planted under such conditions usually is slow, for the reason that the surface soil has been packed hard by the summer rains. It, therefore, is recommended that all standover fields be ploughed before any spring weed growth is apparent, further cultivation being given as it becomes necessary to destroy any weed growth occurring afterwards and to establish a fine seed-bed.

The preparation of a suitable seed-bed for Rhodes grass undoubtedly is advisable, particularly on the old cotton cultivations of the forest soils, as this assists in the establishment of the seedlings and, in addition, ensures a good supply of nitrate-nitrogen in the upper soil to promote a quick vigorous growth of grass.

As the idea of sowing the Rhodes grass on the old cotton cultivation is to check weed growth, improve the physical condition through the development of a large population of grass roots and reduce the nitrate content of the soil, it is advisable to sow the grass at a rate sufficient to give a thick even cover. In this respect it should be borne in mind that usually Rhodes grass germinates only moderately well, so a good rate of sowing should be used—preferably 8 to 10 lb. per acre. Care also should be exercised to avoid sowing too deeply—dragging a brush harrow after broadcasting the seed usually gives ample cover in a normal season.

Seeds Every Farmer Should Know.

F. B. COLEMAN, Officer in Charge, and R. J. HOLDSWORTH, Inspector, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

[*Continued from p. 606, Part 6, Vol. XLV.—June, 1936.*]

(PART III.)

DODDER.

AS an introduction to this article, it may be stated that there are several kinds of Dodder (*Cuscuta* sp.) found in Queensland, the difference between them being in most cases minute.

It has therefore been decided to describe and illustrate a dodder actually found growing on lucerne in Queensland.

The following descriptions of dodder and its most common host plant (in Queensland) lucerne, should be of value in assisting in the identification of these seeds:—

Cuscuta spp. (Fig. 9).

Common name.—Dodder.

Description.—Dull rough seed, brown to very dark brown colour, rounded on one face, flattened maybe on one or more faces, very irregular in shape, could easily be mistaken for a piece of coloured dirt.

Size.—Very variable, diameters from ½ to 1½ mm.*

Occurrence.—Found in seeds of the following cultivated crops:—Lucerne, clovers, linseed (flax).

Medicago sativa (Fig. 10).

Common name.—Lucerne. In the U.S.A. referred to as alfalfa.

Description.—Seeds dull surfaced, of colours varying from light yellow to dark brown, also green, darkens with age, distorted kidney shape but very variable; the hilum mark is a ring with a depression in the middle.

Size.—Variable, average 2 to 3 mm* long by 1 mm thick.

Occurrence.—A commercial crop of great value for feed and seed. Often referred to as "The King of Fodder Crops."

Sometimes one finds a lucerne seed sample containing red seeds. This is the result of action taken by the Commonwealth authorities at the port of entry of the seed to cause a portion of each consignment

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* mm = millimetre 25.4mm = 1 inch.

DESCRIPTION OF PLATE 251.

Fig. 9 Dodder x 5.
Fig. 9A Dodder natural size.
Fig. 10 Lucerne x 5.
Fig. 10A Lucerne natural size.
Fig. 11 Lucerne Plant with Dodder half natural size.
Fig. 11A Capsules x 2.
Fig. 12 Lucerne Seed and Dodder Seed x 5.

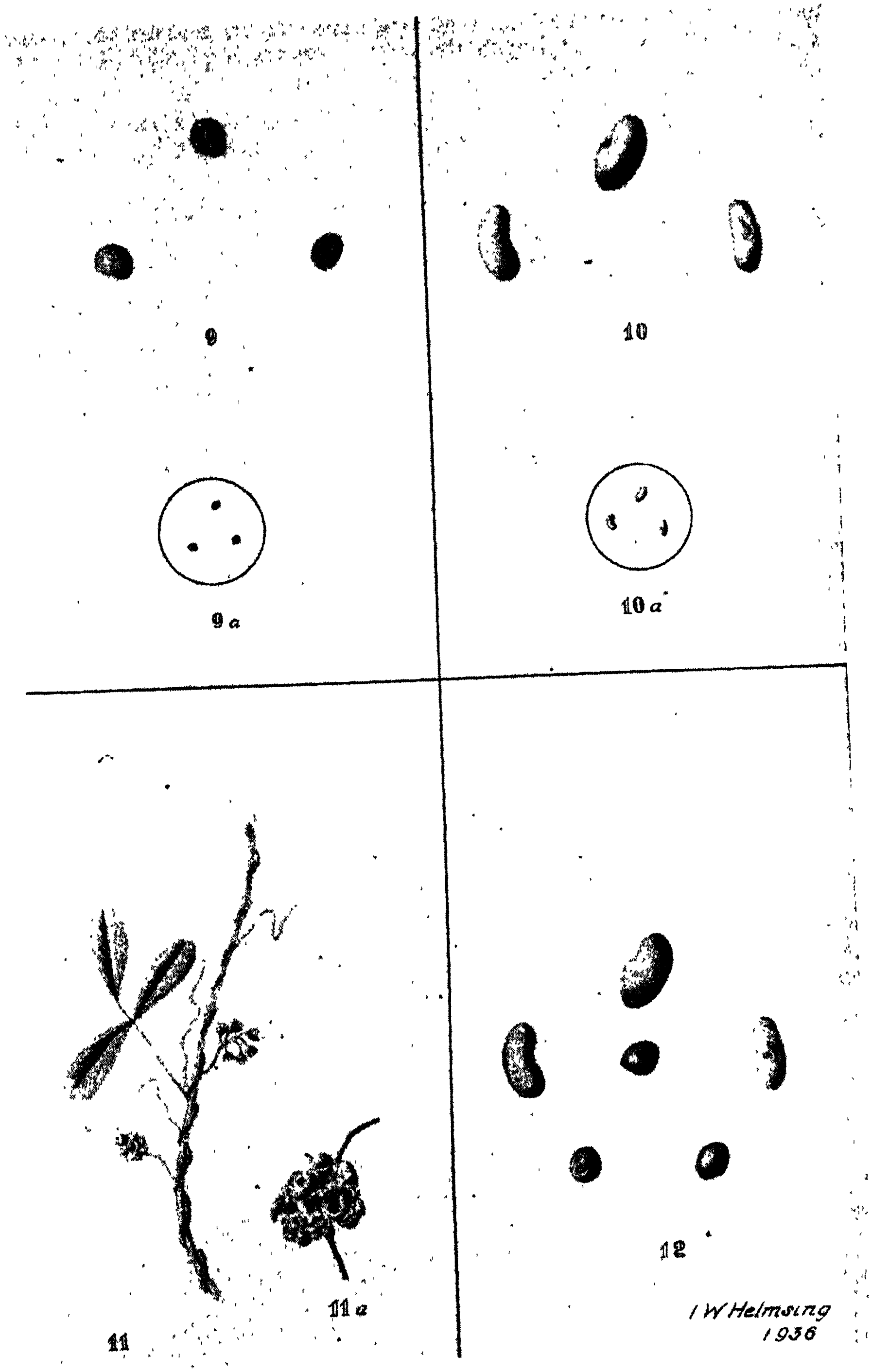

Plate 251.

entering Australia to be stained and then mixed with the bulk to which it belongs, thereby indicating to the buyer that the seed in question was grown outside Australia.

Presence Prohibited.—The seeds of all *Cuscuta* spp. (Dodder) under the Pure Seeds Acts and the seeds, plants and parts of such plants under the Stock Foods Acts, are totally prohibited.

The following extract from "Plants Poisonous to Live Stock," by Harold C. Long, is worthy of repetition:—

> "Dodders (*Cuscuta* spp.), when parasitic on clovers and fed as fodder or hay, have been suspected of causing digestive troubles in horses and cattle in the United States. Muller records a case of poisoning of young pigs by *C. europæa*, with inflammation of the intestines and nervous symptoms. Barbey determined the presence of the glucoside Cuscutin in *C. epithymum.*"

Black's Veterinary Dictionary mentions as follows:—

> "Dodder, Poisoning by.—It seems possible that the parasitic dodder, which may attack clover or hay crops, may, when fed to horses and cattle, cause digestive troubles. The progressive farmer, however, will always take the precaution of having patches of dodder (*Cuscuta europæa* and *C. epithymum*) cut with a scythe from amongst a green fodder crop and burned before any seeds have been produced which will contaminate his samples, or before the parasitic plant has attained serious dimensions."

It should be noted that while clover is specifically mentioned above, the remarks apply equally to lucerne.

Dodder belongs to the convolvulus family. It is an annual parasitical plant found in the warmer parts of the globe. It is leafless, with twining thread-like stems which attach themselves to the host plant by means of tubercles; these are clearly seen in Fig. 11. The dodder seed germinates in the soil, sends up a stem and attaches itself to the host plant which in Queensland is mostly lucerne. The tubercles enter the stem of the host and from then on the parasite draws its nourishment from this source and severs its connection with the soil. The immediate effect is that the host plant is called upon to support not only itself but also the Dodder until ultimately the exhausted plant dies, in most cases smothered in a tangled mass of light brown threads. Dodder quickly produces seed, so that it can run the full life cycle (seed to seed) before the host plant dies—literally from starvation.

Dodder seeds are borne in a globular capsule with 4 seeds in each. These seeds are pressed together, giving them their characteristic flattended surfaces.

Eradication.—If one is unfortunate enough to find this pernicious parasite in a crop the sooner steps of eradication are taken the more chance of success there is. It must be remembered that dodder can be propagated by seed and also by pieces of the threadlike stems, no matter how small they may be. With this in view it is imperative that the method of destruction be such that can take place on the site where the parasite is growing and the best way to achieve this is to burn out the infested patch by covering same with litter, straw, or other readily

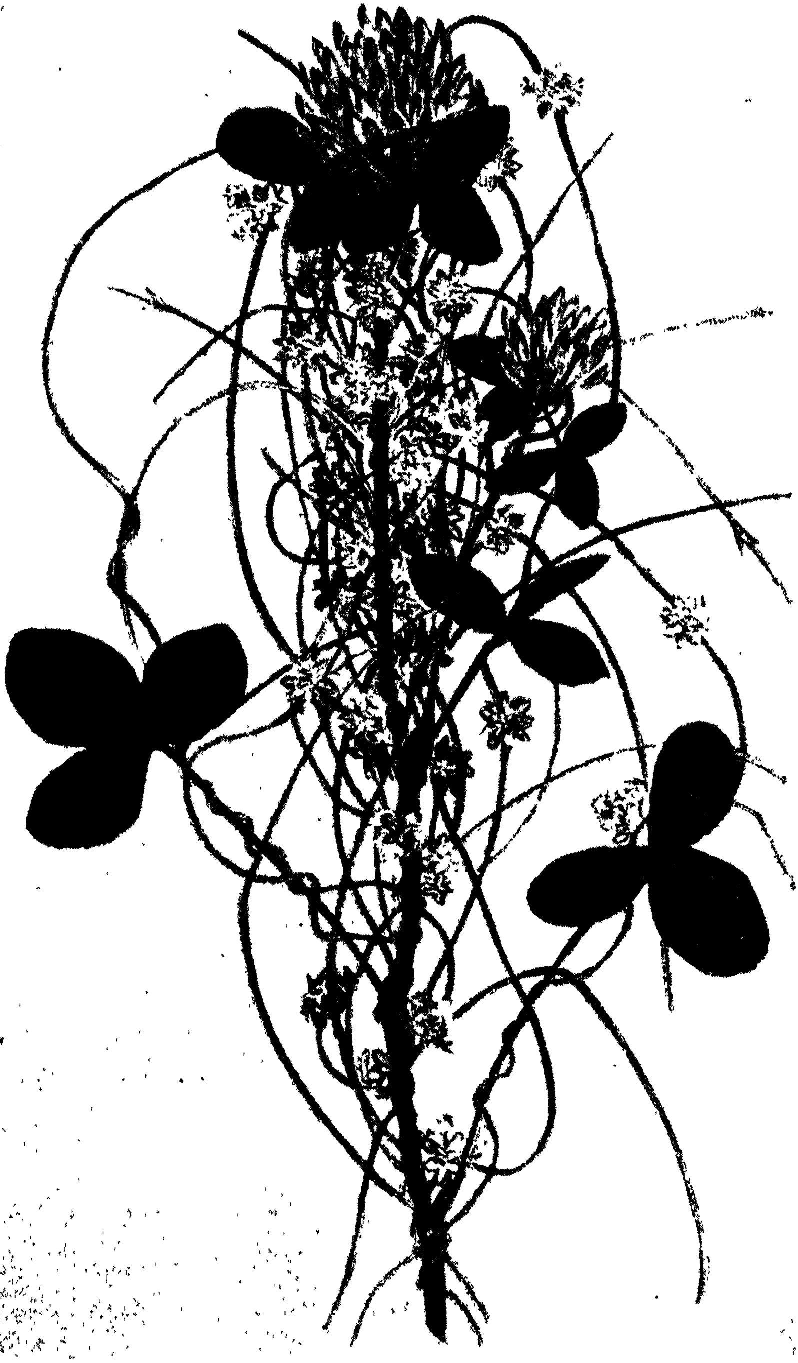

Plate 252.
Red clover heavily infested with Dodder.

inflammable material, taking care to make a considerable overlap into the adjacent apparently free area so as to include any young dodder growth not easily seen. It is best to prevent any persons or animals walking over the infested area, as they are liable to carry seeds or parts of the parasite to the clean area. After burning has taken place a careful watch should be kept in order to detect any minor growths that may occur. All dodder-infested patches should be burnt over before seeding, or harvesting, otherwise harvesting machinery will spread the parasite further afield.

In addition to being parasitical upon lucerne, clovers and linseed (flax)—as mentioned above—it should be noted that Dodders have been found growing on many different kinds of weeds of cultivation in Queensland.

Infestation can result from purchasing agricultural seed containing Dodder seeds, by floods washing the seed or parts of the plant down from higher up the creek or by being carried in earth or mud collected by humans, animals, vehicles or implements.

Unfortunately, there is a considerable quantity of this parasite present in lucerne grown in this State and it is our experience that all the Dodder seed cannot be satisfactorily removed from lucerne seed by means of cleaning machinery or sieving; this statement is based on many unsuccessful attempts to make saleable, parcels of lucerne seed that are Dodder-infested.

Buyers should always insist upon an assurance that the seed they are purchasing is Dodder-free.

Growers of lucerne seed in fairness to themselves as well as to the persons who may sow the seed, *should never harvest seed from a Dodder-infested field.*

It should be borne in mind that any seed for sowing or any material found to be Dodder-infested is subject to immediate seizure and the person offering same for sale is liable to legal proceedings. No excuse can be accepted for the presence in seed or feed of such a destructive parasite which can well be considered as lucerne's worst enemy.

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ANAPLASMOSIS.

Anaplasmosis is a disease of cattle which is caused by a minute blood parasite. Under natural conditions it is spread by the tick. When cattle are inoculated for tick fever, it happens frequently that they show signs of sickness about a month to six weeks after the inoculation. This was often recognised by stockowners and was called the "second reaction." It is now known that this second reaction is due to an entirely different organism from the one that causes ordinary tick fever or redwater.

The chief symptoms are dullness and a disinclination to feed. This lasts for a week to ten days, during which the animal may lose much condition. Jaundice is also seen. Sometimes the animals take a long time to recover completely.

Although the anaplasm is widely distributed throughout the tick-infested area of Queensland, outbreaks of anaplasmosis in the field are unusual. Just recently, however, attention has been drawn to two or three instances of deaths occurring in dairy cows in which inquiry and examination have shown that the mortality was due to anaplasmosis.

Treatment is of little value. It is best to leave the animal alone. Driving the animal is particularly harmful. A mild purgative is useful. Drastic drug treatment of any kind is to be avoided.

—*Dr. John Legg.*

A New Trash Plough.

N. J. KING.*

IN the Canegrowers' Quarterly Bulletin of October 1st, 1935, was printed a short note regarding a new trash-cutting device. This attachment has been considerably improved since that time and has now reached a stage where the experimental period has practically passed. No doubt some minor improvements will still be made, but up to date the plough has made an excellent job of covering some heavy crops of trash.

Plate 253.

New trash plough: position and drive of cutting wheel.

The land wheel of the plough acts as the driving wheel for the cutter. By means of a chain drive and a counter-shaft from the land wheel a second chain drives the cutting wheel at a considerable speed. The cutting wheel, on which the knives are curved, takes the trash against a stationary blade, thus cutting off a length of trash equal to the width of the plough-cut. A shoe runs along the surface of the ground, lifting the trash and guiding it to the revolving cutter. To avoid inequalities in the surface making the shoe dig into the soil the entire cutting device and shoe are swung on two shafts. Should the shoe strike a rise or some high stubble the entire arrangement swings back and up, still cutting the trash, and returns to the normal level when the obstruction is passed.

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* In the "Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations).

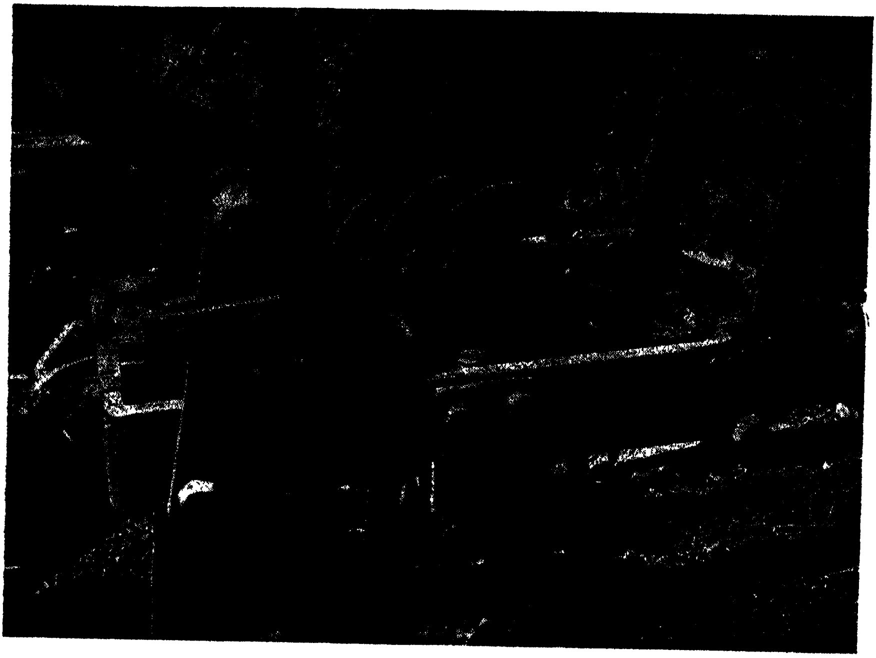

Plate 254.

New trash plough: detail of cutting wheel.

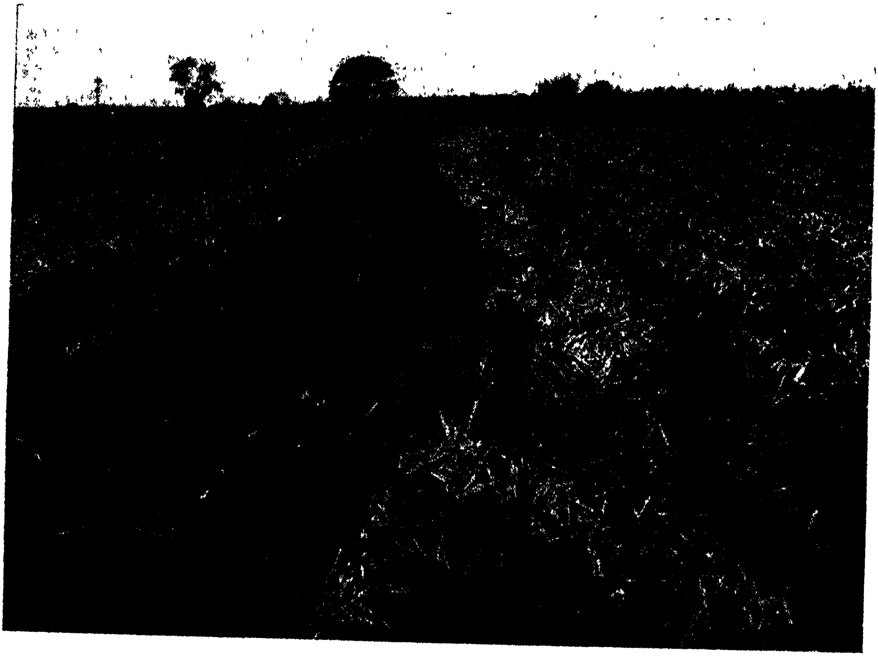

Plate 255.

Illustrating the work of the new trash plough; left: trash covered unploughed land; centre: trash ploughed in with trash plough; right: trash ploughed in with single disc plough.

The photographs illustrate the plough and the cutting device. Plate 255 shows the type of work done; on the right is the result of ploughing in the trash with a single disc plough, while in the centre is shown the result of the trash plough, and on the left the unploughed, trash-covered ground. Dead sticks did not interfere with the cutter. The outstanding advantage of turning in the trash with such a plough is that the trash is directed after cutting into the bottom of the furrow by means of a small mould-board. The cover of soil then covers the trash to a depth depending on the depth being ploughed. In the above case eight inches of soil covered the trash. An ideal seed bed for a green manure crop is thus obtained, and the trash is not mixed up with the soil as is often the case, providing air spaces and allowing rapid drying out. The trash plough illustrated is the invention of a Bundaberg farmer, and undoubtedly promises to overcome the long-felt need for an implement capable of dealing with this difficult material.

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SEEDLING HOTHOUSE AT BUNDABERG.

The erection of a new hothouse for the propagation of cane seedlings has just been completed at the Bundaberg Sugar Experiment Station. The house is heated by a hot water pipe system, during cold nights, while the warm humid atmosphere which is maintained throughout the daytime, provides those conditions which make for speedy germination of seed, and rapid growth of the young plants.

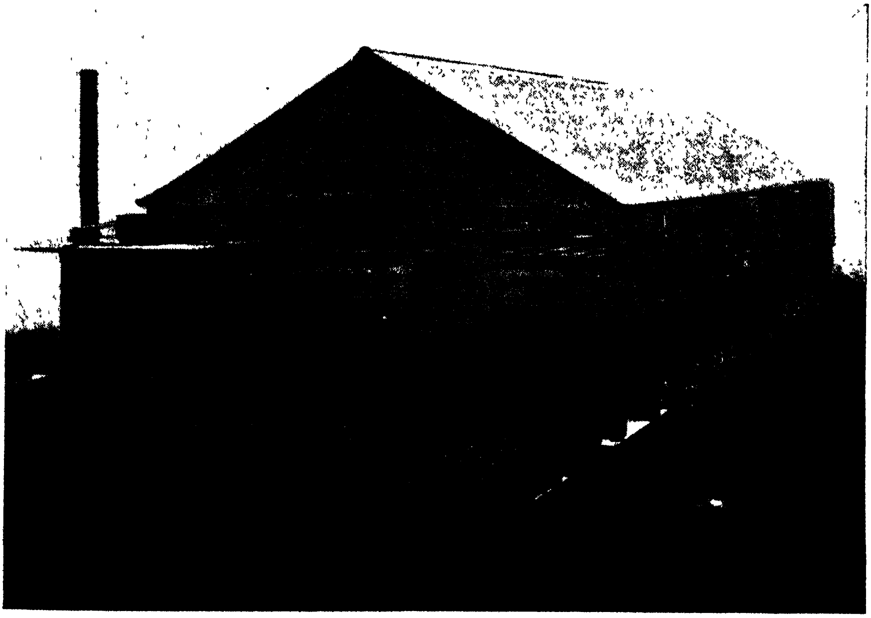

Plate 256.

New seedling house, Bundaberg Sugar Experiment Station.

In the construction of the house, free use has been made of a modern material which has been used successfully elsewhere as a glass substitute. It consists of a cellulose preparation, reinforced by stainless wire gauze, which is highly translucent, and allows free passage of the light rays most active in growth promotion. This material makes for economy in that it is cheaper than glass, both in purchase price and fixing costs, and it is, in addition, hail proof.

In front of the hothouse will be seen the concrete seedling benches on which the potted seedlings are grown. They are set out in a double row, between which runs a tramline, so that the seedlings, in flats or pots, may be transported expeditiously.

N.J.K., in the "Cane Growers' Quarterly Bulletin."

INTENSIVE CANE PRODUCTION.

H. W. KERR.*

It will be recalled that four years ago we commenced a small scale irrigation trial at the Bundaberg station, to demonstrate what could be grown on the red volcanic soils of Bundaberg, when soil moisture and fertility ceased to be limiting factors. The new variety P.O.J. 2878 was planted in the experimental area, and the crop was liberally fertilized and watered throughout its growth period.

We have now the results of three crops—plant, first and second ratoons. The aggregate yield per acre of cane and sugar are as follows:—

Total cane yield per acre (3 crops) .. **233 tons.**

Total sugar yield per acre (3 crops) .. **28 tons.**

These yields are far in excess of the Queensland average, and demonstrate still further the extreme value of irrigation as an aid in cane production, particularly where deep fertile soils are available in areas of light and erratic rainfall.

The benefits of the practice have been so vividly proven to growers in the Southern districts that in all mill areas, it is pleasing to note, many growers are attempting to turn all available water resources to good account. Unfortunately, the frequency with which suitable local supplies are encountered is far from high, and in most cases, collective action would be necessary to finance the cost of a scheme designed to effect wider utilization of natural streams.

We have also been able to demonstrate that the fears of serious over-production of cane, due to the adoption of intensive production methods, need have no foundation; growers could reduce their cane acreages proportionately to their tonnage-per-acre increases, and devote the land thus liberated to the production of alternative crops, the growth of which, under irrigation, could also be made worth while. Care in the choice of the supplementary crop selected would also assume the production of those commodities for which a ready market exists.

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* In the "Cane Growers' Quarterly Bulletin."

Plate 257.
Artesian bore on Yamburgan Station, near Dirranbandi, Queensland. Capacity, 600,000 gallons a day.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Jersey Cattle Society, production charts for which were compiled during the month of September, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW, STANDARD 350 LB.			
Empress 32nd of Sunnyside	P. Moore, Wooroolin	9,835·8	436·128	**Bruce of Avonel**
	SENIOR, 2 YEARS, STANDARD 250 LB.			
Sunnyview Rosemary	C Stumer, Cooranga	6,311·91	250·468	**Lovely's Commodore of Burradale**
	JUNIOR, 2 YEARS, STANDARD 230 LB.			
Trevor Hill Cinderella	G. Gwynne, Umbiram	6,112·1	238·35	**North Glen Emblem.**
College Pigeon 4th	Queensland Agricultural High School and College, Lawes	5,721·5	246·491	**College Butterman**
	JERSEY.			
	JUNIOR, 2 YEARS, STANDARD 230 LB.			
Glenview Springtime	F. P. Fowler and Sons, Coalstoun Lakes	4,973·3	250·443	**Trinity Governor's Hope**
Glenmoore Xmas Lily	L. J. Comiskey, Warra	6,024·62	262·316	**Wheatlands Jester**
Glenview Mayfair	F. P. Fowler and Sons, Coalstoun Lakes	4,741·7	279·854	**Trinity Governor's Hope**
Medowvale Chrysalis (258 days)	Young Bros., Kingaroy	5,613·3	335·227	**Kathleigh Jersey King**

The Tropics and Man

The Capacity for Work.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

Second Series: No. 4.

NO part of tropical physiology forms a more active battle-ground for opinions based upon prejudice than this question of work capacity. I have endeavoured, as far as I possibly can, to base my opinion upon observed facts and unbiased reasoning from these facts. I am quite aware that my opinion will be assailed from one camp, at least, and possibly from more than one. This fate cannot, however, alter facts, and facts must in the end prevail. I want to run quietly over the observed facts with you first, and then let you make the obvious deductions with me. I am sure that, if you banish prejudice from your minds, you will reach the same conclusion.

Muscular Exertion.

What requirements must be satisfied for the body to do muscular work? First of all, the muscles themselves must be in good order and condition. They must, amongst other things, have enough water, enough of the different salts and the right balance between acid and alkaline substances. Secondly, there must be an ample and continuous supply to the muscles of food substances (especially glucose) and oxygen by the blood-stream. Thirdly, the waste products, particularly lactic acid, must be taken away at a sufficiently rapid rate to avoid undue accumulation. Lastly, but very importantly, the nervous system which stimulates the muscles to action, and co-ordinates the action of muscle to make possible delicate, smooth and efficient movements, must be in the pink of condition.

This list of requirements sounds fairly simple; but anyone who has had to probe the intimate life of body tissues will be well aware of the huge complexity and delicate adjustment underlying each of these requirements. I hinted in the last article at the extraordinary complexity of the human nervous system, for instance. If anything goes wrong with this, it does not matter how efficient the actual muscle is, it cannot be directed to the best advantage.

Faulty Blood Circulation.

The most common disturbance which arises in the tropics, or in hot industries, is a relative failure of the blood circulation. The blood vessels in the skin are often so dilated in an attempt to get rid of heat from the body, that the volume of blood, even when the reserves have been mobilised, is insufficient to fill all the blood vessels properly. The tissues which suffer most are naturally the more delicate ones, and of these the nervous system is the most important. As regards work, the first effect is often a dwindling of the will to work, and a growing irritability which tends to find fault unduly with minor affairs. If care is not taken to combat this mental attitude, and "snap out of it," a vicious circle is often set up, in which necessary exercise and work is neglected and the bodily condition made worse instead of better. In the less severe degrees of heating the body is inclined to "cry wolf" and utter warnings before they are necessary, and undue notice of them might actually make the condition of the body worse.

If the circulatory failure is more severe, then very definite interference with muscular power is brought about, and if too strenuous attempts are made to overcome this, harm may easily result. The man with the very stable nervous system can often outstrip his more delicately adjusted fellow-workers, but he is the man who is liable to get heatstroke from a very high rise in body temperature.

Circulatory failure also interferes with muscular action by allowing waste products to accumulate in the active muscles. The familiary muscular soreness following unaccustomed work is due to this, and the sore tiredness of the leg muscles on a hot day is also the result of impoverished circulation in the legs. Muscular tiredness, which is so familiar in hot weather is due partly to nervous disturbance, and partly to an accumulation of lactic acid in the muscles improperly supplied with blood.

Loss of water from the body—dehydration—is a further disturbing factor. As I have said previously, tropical residents as a whole do not drink enough water. Dehydration accentuates circulatory troubles and interferes still further with muscle action.

Loss of salt, if severe, produces very painful muscle cramp and may be fatal. A less severe reduction of salt may be another factor reducing muscle power, although this has not been proved.

A rise of body temperature up to 102 degrees is not a handicap, in fact, it may be an advantage. A rise beyond this is a handicap which increases as the temperature rises. Above this temperature the cells are being worn out too quickly and consequently cannot do their job properly. At 108-110 degrees, the nervous tissue is killed. This is the true heat stroke.

The Net Result.

As a result of experiments conducted in different laboratories and in view of one's knowledge of bodily working, it seems that the position as regards muscular work in the tropics can be crystallised in the following conclusions:—

(1) At effective temperatures below 74 degrees, hard muscular work can be carried out by the average man with little detriment to his body or loss of efficiency. (Only the south-east corner and the mountainous regions of Queensland satisfy this condition at 9 a.m. during the hottest month of the year.)

(2) As effective temperature rises above 74 degrees, the severity of the work which can be carried out by the average unacclimatised man without loss of efficiency or detriment decreases to none at 86 degrees effective temperature. (The highest average 3 p.m. effective temperatures reached in the hot months in Queensland are 84 at Normanton and Croydon, with a little less at Urandangie and Winton.)

(3) The severity of the work can often be temporarily increased above these limits, but it cannot be maintained at this high level, at least without detriment to the body. The body seeks to protect itself against damage by reducing the work capacity.

(4) Training, acclimatisation, social conditions, nutritional state, and interest in the work affect work capacity more readily than at lower temperatures. The extent to which the first two affect local reaction badly needs working out, and will become a point of major research by the Physiology Department in the near future.

Practical Points.

It seems clear from the considerations I have mentioned that at least during the hottest month, a very large part, if not the whole of Queensland, is under conditions during the ordinary working day which threaten or even force a reduction in work capacity as compared with colder climates. It remains to be decided by careful observation and research to what extent it remains a threat and to what extent it is actually, or need be, operative. Training, acclimatisation and deliberate attention to working and living conditions are all important factors and may tip the balance one way or the other.

Even at this stage, certain broad principles stand out whereby the threatened or actual interference may be reduced. In the first place, the fullest use should be made of the very wide range of information available in the field of industrial hygiene, with regard to simple measures for ensuring a maximum of both comfort and productivity in industry. In "industry" I include primary, secondary and tertiary industries, and by "worker" I mean every man who uses his muscles in productive labour. Measures which improve these in temperate countries are even more necessary and useful here. Fatigue in industry has been greatly reduced by attention to details of work, many of them very simple.

In the second place, the effective temperature should be reduced as much as possible by free ventilation and air movement in humid climates and by insulation and evaporation in arid climates.

Thirdly, clothing should afford full movement of limbs and the freest circulation of air over the body, particularly in humid climates.

Fourthly, the nutritional plane of the tropical dweller and worker should be raised to the highest possible point under local conditions, not only by quantity of food, but, more importantly still, by the quality of food, according to modern nutritional ideals.

Lastly, social amenities should be raised and kept at the highest possible plane. Lack of social amenities is one of the biggest deterrents to land settlement and development.

HOME-MADE ANVIL.

A home-made anvil can be constructed from a 4-feet piece of railway metal

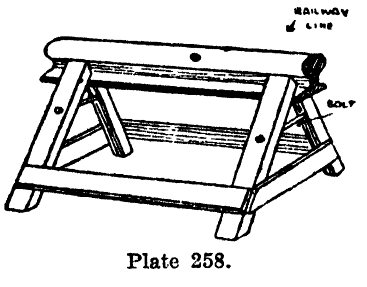

Plate 258.

mounted on a trestle as shown in the sketch. This will stand a lot of heavy pounding and comes in handy in many ways on the farm.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Annual Hibiscus.

R.A.T. (Ardenlea, via Stanthorpe)—

The specimen forwarded represents *Hibiscus trionum*, a small annual hibiscus sometimes known as *bladder ketmia.*. It is widely spread over the warmer regions of the world. In Queensland it is very abundant on the black soil parts of the Central-West, and is often seen as a weed on the Darling Downs.

It is not known to possess any poisonous or harmful properties, and does not seem likely to become an aggressive weed.

Wild Rice.

J.M.R.C. (Emerald)—

The specimen submitted is *Chionachne barbata*, a grass with a fairly wide distribution in the Central-West and North-West. We have not heard a distinctive local name applied to it. About Hughenden it frequently is known as wild paddy or wild rice, although these local names belong more correctly to a true wild rice which grows in North Queensland, particularly about the Gulf country.

Native Tobaccos.

O.S.C. (Mackay)—

The specimens forwarded represent *Nicotiana Debneyi*, one of the commonest of our native tobaccos.

The Australian species of *Nicotiana* have been under review recently, and several species are recognised now which were all listed in the Queensland flora as *Nicotiana suaveolens.*

Variety of Grasses from West Moreton

J.C. (Calvert)—

1. *Cynodon dactylon*, common couch grass. A very nutritious grass, and one of the best fodders we possess. It makes only a light leaf growth, however, and its carrying capacity is not very high.
2. Not received.
3. *Heteropogon contortus*, bunch spear grass. This grass is very palatable in its younger stage, and even when older, I have known it to be made into chaff during drought periods.
4. *Vicia sativa*, var. *segetalis*. This is a variety of the common vetch. It is quite a good fodder.
5. *Digitaria marginata*, summer grass. This grass is very widely spread over the warmer regions of the world. It is mainly a weed of cultivation in the ordinary pasture. It is mostly found on sandy land, and is quite a good fodder.

Milk-tainting Weeds.

G.H. (Booinbah, via Goomeri)—

The worst offenders among the weeds submitted are the various members of the family *Cruciferæ*, which includes a number of weeds frequently known as turnip weeds or mustard weeds. There are other weeds belonging to different families which are very bad offenders in this respect. These include:—

Shepherd's Purse (*Capsella bursa-pastoris*), Bitter Cress (*Senebiera didyma*), Pepper Cress (*Lepidium ruderale*), Turnip weed or wild mustard (*Brassica juncea*), Wild carrot (*Apium leptophyllum*), Fish weed (*Chenopodium triangulare*), Turkey weed (*Rivina lævis*), Melilot or hexham scent (*Melilotus indica*).

Common Weeds. Rattle Pod.

A.J.B. (Proserpine)—

The specimens have been determined as follows:—

17. *Bidens pilosa*, cobbler's pegs.

18. *Crotalaria striata*, rattle pod. This plant is very widely spread over the warmer regions of the world; it is probably a native of Queensland as well as of Asia. It is largely used in some countries as a green manure, particularly in Ceylon as a green manure for tea. It has been proved poisonous to stock, although they do not eat it in sufficient quantities.

19. *Richardsonia brasiliensis*—a very common weed in coastal Queensland. It was boomed some years ago as a fodder under the name of Mexican clover, but so far as our experience goes stock did not take readily to it. It is in no way related to the true clovers or trefoils, but belongs to the family *rubiaceæ*.

20. *Physalis minima*, wild gooseberry. A very common weed in coastal Queensland. It is closely related to the Cape gooseberry.

21. *Boerhaavia diffusa*, tar vine. A very common weed in Queensland, found from the coast to far inland. It is generally looked upon as quite a good fodder for stock. The name tar vine comes from the small sticky fruit the plant possesses.

Weed from East Indies.

K.L. (Ingham)—

The specimen forwarded by the Director, Bureau of Sugar Experiment Stations, in your behalf is *Cleome aculeata*, a native of tropical America, now a common naturalised weed in most tropical countries. It is very abundant in parts of the East Indies, and probably was introduced into Queensland from either Java or Singapore.

The plant has been established in Queensland for many years. We first received specimens of it from Mr. Newport in 1904, when he stated that it was a common weed in paddocks about Kamerunga (Red Lynch). No common name has been applied to the weed. No report has been received as to its having a serious effect upon cane, other than ordinary weeds would have; and neither it nor its allies are known to be parasitic. Although the weed has been established in Queensland for some time it has not generally manifested itself as an aggressive plant.

Yellow Dock.

S. E. McC. (Greenmount)—

The plant you describe as spinach with the deep red root is the curled dock or yellow dock (*Rumis crispus*), a fairly common weed on the Darling Downs, having a very deep red root with a yellow flesh. It is rather difficult to get rid of, as it has to be dug out carefully, and all roots removed. When cut or cultivated the root sends out a new crown. Unless kept in check it is apt to spread from fresh seeds produced every year in the spring and early summer. Mostly only a few plants are seen, but on some farms it is a serious pest.

Perhaps you had better send a leaf or two of the plant to make sure that the yellow dock is the weed you describe.

Grasses and Sedges.

M.W. (Kanighan, via Gootchie)—

(*a*) *Brachiaria foliosa*, leafy panic grass. A broad- leaved palatable native grass.

(*b*) *Bromus unioloides*, prairie grass. Seed heads are necessary to be certain of a determination. Prairie grass is one of the most extensively-cultivated winter grasses in Queensland.

(*c*) *Themeda australis*, kangaroo grass.

(*d*) *Capillipedium parviflorum*, scented top. A rather coarse forest grass, but a useful cattle food.

(*e*) *Cyperus cyperoides*, a sedge and not a true grass. We hope to publish a book in a short time on "Principles of Botany for Queensland Farmers." This will give you the differences between grasses and sedges.

Ironwood. Scrub Wilga. Yellow-wood.

D.F. (Brisbane)—

The specimens forwarded with your letter have been determined as follows:—

1. *Myrtus acmenioides*, ironwood.
2. *Geijera Muelleri*, a scrub wilga. We do not know how the name Johnstone River hardwood could be applied. It perhaps has some superficial resemblance, but the true Johnstone hardwood is confined to North Queensland.
3. *Rhodosphæra rhodanthema*, deep yellow-wood.

Turkey Bush. Ellangowan Poison Bush.

L.A.B. (Brisbane)—

1. *Eremophila brownii*. A plant moderately common in South-Western Queensland, although we have never heard of its becoming a serious pest. It has no local name, but it belongs to the same genus as the common turkey bush of Charleville, and the native Fuchsia (*Eremophila*).
2. *Myoporum deserti*. Ellangowan poison bush. This plant is very widely distributed in Queensland, and grows right from the coast to the far interior. It is particularly abundant in timbered country and grows very rapidly once this country is ringbarked or cleared. It is generally regarded in Western Queensland as a poisonous plant, and feeding tests have proved its poisonous properties. Much of the trouble, however, so far as we have observed in Queensland seems to be with travelling stock. Constipation and acute inflammation of the digestive tract are results of myoporum poisoning.

Native Marjoram. A Suspected Plant.

W.A.K. (Clermont)—

Ocimum sanctum, holy basil, commonly known as native marjoram in North Queensland. The Australian plant is a form or variety of one widely spread in Asia, particularly in India. In that country it is much used as a decoction in fever and bowel complaints. It is also used as a flavouring. The seeds are mucilaginous, and used as a native remedy in the treatment of gonorrhœa.

Pterigeron odorus—A native plant, for which we have not heard a local name. It has been suspected of poisoning stock on one or two occasions.

Caustic Weed.

G.H.S. (Chinchilla)—

Your specimen is *Euphorbia Drummondii*, the caustic weed, a plant very widely spread in Australia. In New South Wales tests for the presence of a prussic acid yielding glucoside have given positive results. Repeated tests with Queensland plants, however, have always yielded negative results, and the symptoms, as described by experienced stock-owners, are certainly not those of typical prussic acid poisoning.

The animals mostly affected are sheep. The head and neck of affected sheep swell considerably; but, if the swelling is pierced, an amber-coloured fluid exudes, and the life of the sheep may be saved, although the head of the animal has the appearance of having been badly burnt.

It is mostly travelling stock that is affected by the plant, and ordinary paddock-resting stock feed on it with impunity.

Age of a horse, as indicated by the teeth.

A.W. (Sarina)—

A few months before three years old, the horse sheds the two centre milk teeth, which are replaced by permanent. Thus the jaw contains at three years old, two centre permanent teeth and two milk teeth on each side. A few months before four, the horse sheds the two next milk teeth, which are replaced by permanent. The jaw now contains four permanent and one milk tooth on each side. A few months before five, the horse sheds the two remaining milk teeth, which are replaced by permanent. Thus the jaw is now furnished with six permanent incisors, but the corner teeth are mere shells, having no internal wall. A few months before six the inner wall of the corner teeth has grown up level with the outer wall. The mouth is now fully complete in incisors, and no further structural changes take place in them. As a general rule, we may add that the upper temporary teeth fall out a little before those in the lower jaw.

General Notes

Staff Changes and Appointments.

Mr. W. A. Winchester (Bundaberg), Mr. A. McTavish (Yeppoon), and Mr. J. T. Littleton (Inspector of Stock, Innisfail) have been appointed honorary rangers under the Animals and Birds Acts.

Mr. F. F. Walcott (Eagle Heights, Tamborine) has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Sergeant (2/C) J. C. Harris (Blackbutt) and Constable P. Tracey (Bedourie) have been appointed also inspectors under the Slaughtering Act.

Messrs. D. R. L. Steindl and C. W. Leece, assistants to pathologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, have been appointed also inspectors under the Diseases in Plants Acts.

Mr. F. W. Olney, gatekeeper, Border Gate, Coolangatta, has been appointed also an inspector under the Diseases in Plants Acts.

Miss E. A. Crees (Ayr) has been appointed assistant cane tester at the Inkerman mill.

Transfers of officers of the Department of Agriculture and Stock include those of Mr. J. A. L. Rheuben, inspector of slaughterhouses, from Maryborough to Ipswich; Mr. C. Caswell, inspector of slaughterhouses, from Ipswich to Maryborough; and Mr. B. Funnell, banana agent, from Brisbane to Cairns.

Mr. J. J. Leather (officer in charge of waterworks, Teddington, near Maryborough), Mr. M. A. New (Maryborough), and Mrs. W. M. Guymer (Rangeville, Toowoomba) have been appointed honorary rangers under the Animals and Birds Acts.

Messrs. H. V. Damm, D. Krueger, J. Neuendorf, and A. C. J. Herrmann (Fassifern Valley), and G. E. Neuendorf (Kalbar), and T. Von Kistowski (Mt. French) have been appointed honorary rangers under the Animals and Birds Acts.

Dr. G. M. Davidson (Eagle Heights) and Mr. F. W. Taylor (North Tambourine) have been appointed honorary rangers under the Animals and Birds Acts and the Native Plants Protection Act.

Sergeant, 2nd Class, A. S. Gordon (Atherton), and Constables F. Purtle (Calen) and J. V. Kelly (Marmor) have been appointed also inspectors under the Slaughtering Act.

Mr. W. I. Coates, "Eversley," Loganlea, has been appointed an honorary ranger under the Animals and Birds Acts.

Broom Millet Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, extending the operations of the Broom Millet Board for the period from 1st November, 1937, to 31 October, 1943.

Trans-Border Stock Restrictions Rescinded.

An Order in Council has been issued under the Diseases in Stock Acts, rescinding two Orders in Council approved in November, 1930, and May, 1933, which placed certain restrictions on the introduction into Queensland of cattle from New South Wales through the crossing place at Killarney.

Trans-Border Fruit Trade.

A Proclamation has been issued under the Diseases in Plants Acts declaring that the introduction of fruit into the South Coast fruit district of Queensland shall be permitted via the border crossing between Coolangatta and Tweed Heads only at the following times:—

Monday to Friday, inclusive: From 8 a.m. to 4 p.m.

Saturday: From 8 a.m. to 12 noon.

Notice of the arrival at the crossing of any fruit or vegetables shall be given immediately to the inspector at the crossing by the person introducing them. The inspector shall inspect all such fruit or vegetables, and if found to be free from disease, shall, upon the payment of the prescribed inspection fees, issue a certificate for their importation.

Northern Pig Board.

Two Orders in Council have been issued under the Primary Producers' Organisation and Marketing Acts in relation to the Northern Pig Board. The first provides that elections of growers' representatives on the Northern Pig Board shall be held triennially and that members elected shall hold office for a period of three years.

The second amendment covers the delivery of pigs to the Northern Pig Board, and provides that pigs shall be delivered to the Board or its authorised agents by the nearest usual practicable road or railway, within such times, at such places, and in such manner as the Board may fix, or as may be prescribed. At present, it is a condition that pigs shall be delivered in such quantities, description, and condition as the Board may fix by notice approved by the Minister, published in a local newspaper or newspapers.

Anzac Festival Competitions.

Details of the competitions in music, literature, and art generally, arranged by Anzac Festival Committee in connection with the commemoration for 1937-38, have been announced. A prize of £5 is offered for the best script for a pageant epitomizing a cycle of British history embracing the birth of Shakespeare, St. George, the patron saint, the landing of the Anzacs on Gallipoli, the arrival of Captain Cook in Botany Bay, and other prizes, will be open to competition, particulars of which can be obtained from the honorary secretary, Miss Merle Harvey, Scot Chambers, Hosking Place, Sydney. A stamped addressed envelope for a reply must be enclosed with each letter of inquiry.

Cane Growers' Council.

The Queensland Cane Growers' Council Regulations, issued under the Primary Producers' Organisation and Marketing Acts, provide, among other things, that a member of the Queensland Cane Growers' Council, a district executive, or mill suppliers' committee must derive at least 60 per cent. of his net annual income (from personal exertion) from the growing and supplying of sugar cane. These Regulations have been amended to the extent that a farmer deriving 80 per cent. of his income from personal exertion from diversified agricultural pursuits and having not less than ten acres of land under cultivation for sugar cane, may be eligible for membership on such council, any district executive, or mill suppliers' committee.

Co-operative Hail Insurance.

A Regulation issued under the Primary Producers' Organisation and Marketing Acts in November, 1936, empowering the Committee of Direction of Fruit Marketing to make a levy on fruitgrowers in the Stanthorpe district to raise moneys to be applied in establishing and maintaining the Stanthorpe Fruit Co-operative Hail Insurance Fund, has been amended to provide that it shall be a condition of cover that all contributions to the fund shall have been regularly and punctually paid by the grower, and it shall be a condition precedent to his right to receive any payment from the fund that he shall have established to the reasonable satisfaction of the board of control that all contributions payable by him have been so paid.

Plywood and Veneer Board.

Orders in Council (2) have been issued under the Primary Producers' Organisation and Marketing Acts, amending the constitution of the Plywood and Veneer Board and the Northern Plywood and Veneer Board, in relation to the number of elected representatives on such boards, and providing that elections of growers' representatives shall be held triennially and that members shall hold office for a period of three years.

Two Diggers who fell at Pozieres—Who were they?

The Defence Department announces that enquiries have been instituted by the Imperial War Graves Commission with a view to ascertaining, if possible, the identity of two Australian soldiers whose bodies have been exhumed from a spot approximately 500 yards north-east of the village of Pozieres (Somme), France.

In one case a 9-carat gold ring engraved "T.R. to A.R." was found in one dead Digger's pocket, whilst the remains of the other were wrapped in a waterproof sheet upon which the following particulars can be traced:—

"4540, A. F. . . . . nn, D. Company, 16 Platoon."

Any person who may be able to assist in the identification of these two soldiers is asked to communicate with the Officer-in-Charge, Base Records Office, Department of Defence, Melbourne, S.C. 1.

Rural Topics

Improving Production of Cows.

The success achieved by dairymen in the production of their herds depends very largely on the skill and care bestowed upon the cows. It is an easy matter to pick out two classes of dairymen by the condition of their herds. One group has found it pays to keep cows in good condition, and especially at calving time. The other group, not being alive to the necessity for supplying plenty of the right kind of feed at the right time, and, further, assuming that cows need be fed only while they are giving milk, have cows whose condition is anything but satisfactory at the beginning of a new lactation period. These are the men who should make some improvement in their skill in feeding and caring for cows, if the cows are to make them as much money as they are capable of making under right conditions.

Pastures have been deficient in many parts of the State, and as a result a lot of cows will not be in proper condition to calve and carry on their next lactation period. There, however, is still time to give these cows a fair chance to make good before they settle down actually to milk production.

Good dairy cows should have from six to eight weeks' rest between the close of one lactation period and the beginning of the next. More than this, they should be fed well enough to permit them to regain any condition which has been lost because of the short pasture. It is a very difficult matter to feed cows back to condition after they have calved.

The advice given is:—Look over your cows now and pick out those that need some extra feed, and, most important of all, give it to them. Calving troubles, retained afterbirth, and premature calving are costly. Many of these troubles are due to ill condition and may be prevented by proper care before calving.

The Apiary.

This month nectar will be coming in freely in most of the beekeeping districts, and the bees will need an extracting super. This is a hive body exactly similar to a brood-chamber, and is provided with drawn-out combs, or failing these, with frames containing full sheets of foundation. Most beekeepers put only nine frames equally spaced in a ten-frame hive body when used as a super, because the extra space between the combs allows the bees to make thicker and more even combs, which are much easier to uncap. Further, if these "fat" combs are cut down to normal when uncapping, there will also be a material increase in the wax production of the apiary.

If the colony is strong enough, the bees will immediately take possession of the super, but should they be disinclined to go up, a frame of brood may be taken from the brood-chamber and placed above, exchanging it for an empty comb, and this will usually induce the bees to commence storing honey in the super.

Many beekeepers work with a single super to each hive, but it is not the best method, as during a good flow honey is sometimes lost for lack of storage room, while if the unripe honey is removed in order to make room, trouble will occur later on through this watery honey becoming sour and fermenting.

In order to ensure that only thoroughly ripe honey is extracted, and at the same time to take full advantage of a sudden honey flow, several spare supers containing drawn-out combs are necessary. These are tiered up one above the other, as they are required. When adding an additional super to the tier, it should always be placed next to the brood-chamber, and the others containing partly-filled or unsealed comb placed above these two.

The thorough ripening of honey cannot be too strongly recommended, and tiering should be practised, especially in the more humid coastal districts, as the honey is improved in both density and aroma the longer it is kept in contact with the bees.

—*H. Hacker.*

Checking Small Washaways.

Old sacks filled with grass sods placed across small eroded gullies on cultivated land effectively dam up rain water and eventually cause the gullies to fill with soil again.

Colours in Concrete—How to Mix them.

Fine dry colour pigments are used in the preparation of coloured concrete. The usual mixtures are:—

Red: 86 parts of cement and 14 parts of red oxide of iron.
Yellow: 88 parts of cement and 12 of yellow ochre.
Blue: 86 parts of cement and 14 of azure blue or ultramarine.
Green: 90 parts of cement and 10 of oxide of chromium.
Chocolate: 88 parts cement, 6 of black oxide of manganese, 4 of red oxide of iron and 2 of black oxide of iron or copper.
Black: 90 parts of cement and 10 parts of black oxide of manganese or any carbon black.
Pink: 97 parts of cement and 3 of best quality crimson lake.

A few experiments should be made to determine the quantity required. Every batch of colour then should be balanced carefully to ensure regularity in the finished work.

The colour and cement should be blended thoroughly in the dry state. One method is to pass the mixture several times through a fine-mesh plasterers' sieve until a uniform appearance is obtained. The coloured cement should then be mixed with two and a half parts of clean sand until of uniform appearance again. Scoop the mixture out in the form of a crater and pour in the water. The wet mixture should be well shovelled for about ten minutes to obtain the best results.

Where a pure white cement is desired, it is obtained best by using white cement, which is made from pure white limestone and pure white clays. Pure white sand, crushed quartz or crushed marble are the usual constituents.

In the Days when the World was Wide.

The article in the Journal on the subject of overlanding with stock reminds me of the time when I followed the occupation of a drover, writes an officer in the Department of Agriculture and Stock.

My first experience of a long journey was in the early "nineties." Setting out from the Lower Flinders for Bathurst in New South Wales, a distance of 1,500 miles, with a mob of 1,050 bullocks, we reached the end of our journey in twenty-six weeks.

The first "town" was 250 miles from where we took delivery of the mob, and we travelled by way of Jundah, Stonehenge, Adavale, Eulo, Barringdon, and Brewarrina.

We first sighted the railway at Nevertire after a journey of approximately 1.200 miles, and a lapse of five months. With the exception of one beast, which could not be accounted for, the correct number, minus the "killers," were disposed of by auction.

The following year I overlanded a mob of 200 unbroken horses to Dubbo, Orange, and Bathurst.

Sore Teats in Milking Cows.

Sore teats cause much loss to the dairy farmer, and the condition should always be treated suitably on its first appearance. Chapped teats are caused by the sudden chilling of the teats after wet milking, after the calf has ceased sucking, or by contact with stagnant water, filth, or irritants when lying down.

The chapping may be slight, or, on the other hand, it may extend into gaping sores, inducing retention of milk or even causing mammitis.

Sore teats may be prevented by washing the udder and teats thoroughly with warm water and soap when the cow first comes in, carefully drying the udder before applying olive oil to the teats. If the cow already has sore teats, they should be washed with warm soapy water; then thoroughly dried and treated with carbolised vaseline. If the sores are extensive and the irritation great the teats should first be washed with a solution of 1 dram of sugar of lead to 1 pint of rain water, after which benzoated zinc oxide ointment should be applied.

The careful use of a sterile teat syphon is desirable when the sores are very deep and painful, as manual milking opens the sores continually. Wet milking is a dirty and undesirable practice from every point of view.

—*W. Dixon.*

Orchard Notes

DECEMBER.

THE COASTAL DISTRICTS.

THE planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is larger and of very much better quality. This is a very important matter in the case of both of these fruits, as there is but a poor demand for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers are warned that the sending of immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the sale of the main crop. Immature pineapples are not fit for human consumption, and are liable to be condemned by the authorities of the State to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying for scale insects should be carried out where necessary. Spraying with fungicides should have already been carried out where necessary, and, except in the case of a heavy infestation with black spot or brown spot of the Emperor mandarin, no further applications of copper sprays should be required. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with sulphur or sprayed with lime sulphur. Borer should be looked for and destroyed wherever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to sell.

Peaches, plums, papaws, and lemons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early-ripening fruit, and see that none is left to lie under the trees to rot and thus breed a big swarm of flies to destroy later-ripening varieties.

Look out for Irish blight in potatoes and tomatoes, and downy and powdery mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for Irish blight and downy mildew, and sulphur dust or lime sulphur spray for powdery mildew.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle. The season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly oversupplied with this class of fruit, and a glut takes place in consequence. Merchants sometimes make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to get it into consumption as rapidly as possible. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersize, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer. Early ripening fruits should, therefore, be carefully graded for size and quality, handled and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed in to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit-fly regulations must be observed in order to keep these pests under control; otherwise the later-ripening fruits are likely to be attacked severely by these pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew or sulphured for oidium.

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THE EFFECTS OF RAINFALL ON GRASSHOPPER INFESTATION.

Most of the country people in grasshopper-infested districts are at present remembering that the plague grasshopper is normally abundant only in the drier parts of the State and are hoping that the rain will terminate the present outbreak. There is reason to believe that the prolonged dry weather during the past few years was responsible for the present infestation on the eastern Darling Downs and in the Moreton District. Unfortunately, experience during 1934 indicated that once the insect is temporarily present in large numbers in a district, normal or even greater than normal rainfalls may not prevent further large scale breeding for one or two generations. There is, therefore, no foundation for the hope that now rain has fallen the grasshoppers will necessarily disappear immediately from the districts that have benefited. Rather, the rain will ensure a plentiful supply of food for the insects now present.

This somewhat pessimistic viewpoint is not, however, the only one. Rain should definitely improve the position, if it is necessary to deal with another generation later in the season. Baiting work was complicated in this present generation by the fact that hatching took place over a protracted period and repeated baitings of individual egg beds were often necessary. This may have been due to the exceedingly dry condition of the soil during recent months, and it is probable that with normal soil conditions in early summer, delayed hatchings should not be a complicating factor in any future baiting. One realises also that the free growth of grass and herbage should somewhat lessen the seriousness of grasshopper injury on pastures and at the same time provide some measure of counter-attraction which will lessen the risk of injury to standing crops. It is obvious, therefore, that the rain that has fallen will give certain benefits, but it should not be assumed that there will be no further outbreaks in the closely settled districts which are infested at the present time.

While a great amount of valuable work has been done in controlling the present generation by baiting, it must still be realised that in spite of the rains continued vigilance is necessary in order to deal promptly with such swarms of plague grasshoppers as emerge in the next generation.

—*J. W. Weddell.*

Farm Notes

DECEMBER.

ALTHOUGH November is regarded generally as the best period for planting the main maize crop, on account of the possibility of the tasselling period synchronising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or silage. The necessity for such provision cannot be urged too strongly. Farmers who have not had any experience in building a silage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available to demonstrate methods of making silage for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as a fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state; consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. The plant also is a good soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), and Japanese millet. Well-prepared land, however, is required for crops of this description, which make their growth within a very limited period of time.

Successive sowings may be made of pumpkins and melons.

Keep down all weed growth in the cotton field by scarifying as long as the growth will admit of the use of horse-drawn implements.

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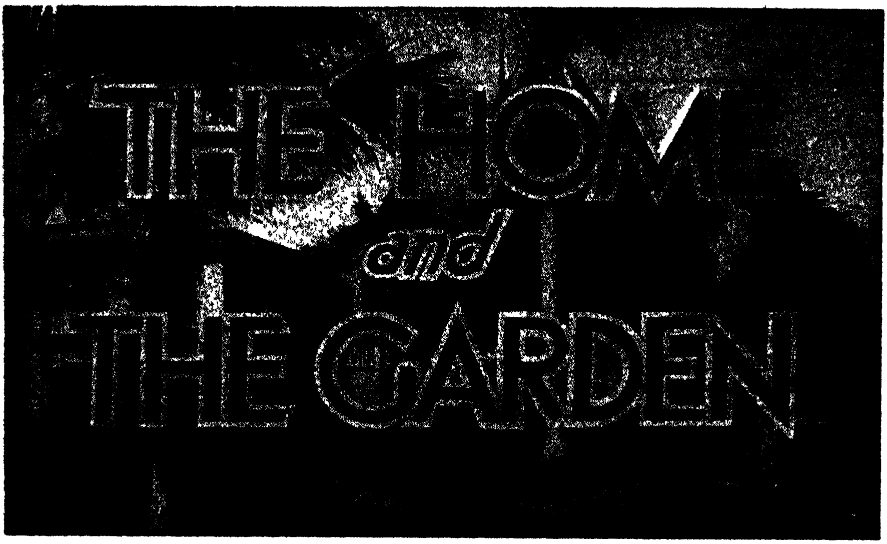
AERATION AND SOIL PESTS.

Soil aeration has a direct effect on the growth of crops. By soil aeration is meant allowing the air to reach the roots of plants. Access of air to the roots results in better crops. Not only does it mean quicker growth and heavier yields, but the quality will be better. The result of providing a good friable root run, such as can only be obtained by constant soil movement, is that the root hairs or filaments are able to spread rapidly in all directions, and find all the nourishment they need to keep progressing towards a really heavy harvest. If the roots of the plants have a free root run they will use up the biggest possible proportion of the fertilizer, and the farmer will receive the full possible return for his outlay. Another point is that the constant working of the soil disturbs large numbers of soil pests, and gives insect-eating birds a chance to destroy them.



OUR BABIES.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE HOT WEATHER BOGY.

BABY enjoys the hot weather. There is nothing that pleases him better than to exercise his limbs freely in the most scanty attire, or in nothing at all, unless it is to splash about in a tub of tepid water. He is released from the burden of clothing which oppressed him in the cold season and cramped his movements.

Of course special care is needed during the hot season in some respects. If you over-clothe baby he will suffer from prickly heat. This is caused by excessive sweating, when the sweat is not allowed to evaporate freely. Dress him in cool singlets, not in heavy woollens. Outside the singlet he should wear only the coolest of airy garments, and these should be taken off when he is indoors. Do not torment him with flannel binders. Prickly heat is worst on his back, because he lies on that, and the perspiration cannot dry off quickly. Let him lie on cool sheets or, better still, on cool vegetable mats. Turn him over sometimes when he is asleep and train him to lie on his side.

He does not now need so much heat-forming food. Give him rather less solid food, rather less sugar and fat (clinic emulsion, for instance). But he needs more fluid, so let him drink as much boiled water as he likes between his meals. Do not forget that this is necessary for babies who are on the breast.

During warm weather all kinds of bacteria grow very rapidly, and so food does not keep but undergoes changes which make it unwholesome and sometimes even dangerous. Especially is this true of milk.

You know how quickly it goes sour. Unfortunately it changes in other ways which are more harmful than sourness. Therefore be careful to boil your milk as soon as you get it; then keep it in a cool place carefully protected from flies. Pasteurised milk delivered in bottles does not need to be boiled. It will keep good for twenty-four hours on ice; but otherwise, if you have only one delivery, you will need to boil it within twelve hours if it is to be kept till next morning. Should your milk be stale or dirty before it is boiled it will cause loose motions. When good fresh milk cannot be had you may use dried milk (Glaxo or Lactogen).

Loose motions or diarrhœa is common in warm weather, and needs careful watchfulness. Should your baby suffer from this you must at once stop giving him milk or any kind of food except very thin barley water slightly sweetened. Let him drink as much as he wants; he will be thirsty but not hungry. It may be even necessary to take him off the breast for one or two days. You may also give him one teaspoonful of castor oil to clear out any undigested food. Within twenty-four or forty-eight hours he should be much better, and probably a little hungry. A little breast milk may then be given, or you may then give him whey made with junket tablets, but the whey must first be brought to the boil. If he is over nine months you may also give him some arrowroot, cornflour, or sago boiled with water without milk, or a finger of bread baked hard and crisp. Do not give him milk foods until his motions become natural, and give the milk at first in very small quantity, increasing it gradually.

By this treatment attacks of simple diarrhœa are usually easily cured. But it is very different with diarrhœa caused by infectious bacteria. Of these the most dangerous is dysentery, which attacks us every year in the early summer during the fly season, not, be it observed, in the hottest time of the year, when the epidemic usually subsides.

We hope that our advice will be carefully observed, and that it will save many lives. The cause of the increased sickness and more frequent deaths among our infants during the summer is not the hot weather; it is the prevalence of dysentery and other bowel infections during this season. This infection occurs so frequently because mothers do not know how dysentery bacilli get into their babies. Babies have died from want of knowledge.

IN THE FARM KITCHEN.

EGGS FOR ALL MEALS.

Eggs Tartare.

Take 6 hard-boiled eggs, 1 lettuce, 1 teaspoonful chopped onion, 4 oz. boiled ham, ½ teaspoonful made mustard, small quantity mayonnaise, pepper, salt, and cayenne to taste.

Shell the eggs and cut in halves lengthwise. Remove yolks and mix to a smooth paste with the onion, minced ham, mustard, pepper, salt, and cayenne to taste, adding mayonnaise to moisten. Fill egg-whites with the mixture. Arrange in a salad bowl lined with lettuce leaves. Place a dab of mayonnaise on top of each before serving.

Scotch Eggs.

Take 4 eggs, ½ lb. sausage meat, flour, egg, and breadcrumbs, nutmeg, flour, salt, and pepper.

Remove the skin from the sausages and season with a little salt, grated nutmeg, and pepper. Boil the eggs hard and remove the shells, dip each egg in flour. When cooking eggs, see that the water covers them completely. Roll each in a cake of sausage meat. Dip in beaten egg and crumb twice. Fry in deep smoking hot fat till crisp and golden. Serve when cold. Set in halves in a dish lined with watercress or lettuce.

Egg and Rice Pie.

Take 4 hard-boiled eggs, ½ pint milk, ¾ oz. flour, 3 oz. grated cheese, 1 oz. butter, 4 oz. rice, 1 teaspoonful chopped parsley, salt, and pepper.

Melt the butter in a saucepan. Stir in the flour. When frothy, stir in the milk. Season to taste with pepper and salt. Boil rice in salted water. Drain when cooked. Hold under tap for a moment or two to separate grains. Drain and re-heat, then arrange round a hot dish. Stir cheese into sauce. Quarter and add eggs. Stir till piping hot. Pour into centre of rice. Sprinkle filling with chopped parsley. Serve with a green salad.

Yorkshire Eggs.

Take 4 eggs, 4 rashers bacon, 4 rounds fried bread, ½ teaspoonful butter, 1 teaspoonful chopped parsley.

Grease four ramekin dishes with butter. Sprinkle with parsley. Drop an egg into each ramekin dish. Place in a saucepan containing hot water, coming half-way up the sides. Cover each with buttered paper. Steam for ten minutes or until set, taking care the water does not boil into the dishes. Remove rind from bacon, and chop and lightly fry bacon. Sprinkle over the bread. Turn out an egg and place on each round of fried bread. Surround with fried bacon. Serve with a green salad.

Anchovy Eggs "In the Nest."

Take 2 eggs, 2 small dinner rolls, 2 oz. butter, a little anchovy essence, chopped parsley, a little milk, seasoning.

Take the dinner rolls and slice off the tops. Scoop out the crumbs inside, mix the anchovy essence with the butter, and spread on the inside of the rolls. Break the raw eggs into these, and season. Put the rolls on a baking tin or sheet. Brush over the outside of the rolls with a little milk, and put into a moderate oven until eggs are set. Sprinkle with chopped parsley. Serve with the lids off or on as preferred. Care must be taken that the eggs are not broken when putting them into the rolls.

Eggs with Cheese Stuffing.

Take 3 hard-boiled eggs, 4 tablespoonfuls grated cheese, ½ pint white sauce, 1 tablespoonful butter, 3 tablespoonfuls breadcrumbs, 1 teaspoonful chopped onion (if liked), pepper, salt, and grated nutmeg to taste.

Shell and cut eggs in halves lengthwise, scoop yolks into a basin, and mash till smooth. Then stir in the cheese, crumbs, pepper, and onion, salt, nutmeg, and a little white sauce to moisten. Stuff each egg-white with the mixture. Mould stuffing until the stuffed half looks like a whole egg. Sprinkle each with a few breadcrumbs, and arrange all in a buttered fireproof dish. Pour remainder of sauce round eggs, place a dab of butter on top of each, and bake in a hot oven till a pale brown.

Egg and Potato Nests.

Take 6 large potatoes, 6 hard-boiled eggs, 6 pats butter, 6 tablespoonfuls grated cheese, cayenne and salt. Bake potatoes in their jackets in the usual way. Cut a slice neatly off the top of each. Carefully scoop out half of the inside of each potato. Shell the eggs and drop one into each "nest." Season to taste with salt and cayenne pepper. Add one pat of butter, then a tablespoonful of cheese. Bake in a hot oven for four minutes.

Egg and Fish Scallops.

Take 5 eggs, 2½ tablespoonfuls grated cheese, ¾ cupful well-seasoned white sauce, salt and pepper to taste, ¾ cupful flaked smoked fish.

Mix the smoked fish and sauce together in a saucepan. Boil for three minutes, and divide mixture between five buttered ramekin dishes. Break an egg into each. Sprinkle lightly with pepper and salt, then with grated cheese. Bake in a moderate oven until eggs are set, in about ten minutes.

Plate 259. [*Photo.: Department of Agriculture and Stock.*

IN A WESTERN STATION GARDEN.—This charming scene was photographed on a recent visit to Yamburgan Station, in the Dirranbandi District, Q.

SOME WHEAT RECIPES.

Wholemeal Nut Loaf.

Ingredients.—Two cups wholemeal flour (finely ground), 1 teaspoon cream of tartar, ½ teaspoon carbonate of soda, 1½ tablespoons butter, 1 tablespoon sugar, ¼ cup nuts, ¼ cup raisins, ¼ cup sultanas, 1 tablespoon golden syrup, 1 egg, 1 good cup milk.

Method.—Mix flour, sugar, cream of tartar, and soda, and rub in butter; add nuts and fruit. Dissolve golden syrup in milk and add to well-beaten egg. Mix all together, put into greased tins with lids on, and bake about three-quarters of an hour in a moderate oven.

A raisin loaf without nuts can be made if desired.

Wheatmeal Fruit Cake.

Ingredients.—Half pound butter, ½ lb. sugar, 1 lb. fine wheatmeal, 6 eggs, 1 teaspoon cream of tartar, ½ teaspoon carbonate of soda, ¼ lb. chopped dates, 2 oz. nuts, ¼ lb. raisins, ¼ lb. currants, 1 oz. mixed peel.

Method.—Beat butter and sugar to a cream. Add eggs one at a time and beat for ten minutes. Add fruit, nuts and peel, and wheatmeal, cream of tartar, carbonate of soda, and a little milk if necessary. Put into greased tin and bake from one and a-half to two hours.

Wheat "Coffee."

Ingredients.—Three large cups of wheat, 2 tablespoons treacle, 1 tablespoon golden syrup, 3 teaspoons salt.

Method.—Wash wheat; drain and put into shallow baking dish, sprinkle salt on and mix in treacle and golden syrup, covering well all the wheat. Put into a hot oven and cook for one hour to one and a-half hours, stirring to prevent burning. When well cooked and the colour of the coffee bean when well roasted, remove from oven and allow to cool. Grind through wheat mill and store in sealed tins to keep in the strength.

Use one dessertspoonful of wheat "coffee" powder to each person, and add the hot milk to the coffee when ready to serve.

IN THE FARM GARDEN.

In planning the farm vegetable garden several points have to be kept in mind. The garden should be protected from prevailing winds and livestock, especially poultry, as well as being handy to the water supply and home. All perennial crops should be on one side of the garden, so as not to interfere with tillage operations. When space is limited, too much room should not be taken up with vine crops.

The garden should be planned so as to be economical of labour, and where possible the vegetables should be sown in rows to allow of inter-row cultivation, and the rows should run the long way of the garden. The garden should not be located near large shade trees, as vegetables require plenty of sunshine. The different crops should be grouped according to their cultural requirements and length of time taken to mature. The best soil is one well drained and rich in organic matter, and an abundance of farmyard manure is almost a necessity.

The home vegetable grower has a wide range of crops to chose from, but there are some crops that are outstanding for growing in the home garden.

The true spinach is rarely grown in Queensland, although when properly prepared it is a delicious vegetable, and superior to the silver beet. Varieties like Bloomsdale Savoy and Viroflay should always find a place in the home garden.

The growing of onions in the home garden is quite a simple matter if sets are used. These sets are miniature onions obtained by planting the seed thickly, late in season. The sets produce large early onions.

Peppers or chillies are rarely grown at all in this State. Being so suitable for savouries, relishes, condiments, and stuffed dishes, they are particularly valuable for home growing. The gherkins, or small black-spined cucumbers, find favour with home growers for pickling.,They are grown like cucumbers, but are harvested when one inch to three inches long. The Boston Pickling is a very suitable variety to grow.

Something Different.

By way of providing something different, sweet corn, not field corn, should appeal to country people. Sweet corn may be grown in the garden to shade such crops as melons. It is advisable to have a succession of plantings to provide corn for a considerable period. It is important to harvest the corn at the correct stage—that is, when the grains are plump and still in the milk stage. It should be gathered just previous to cooking, as the quality is injured if kept for long periods.

Peas and beans give best results for home use when grown on trellises.

A bed of rhubarb is always valuable, and is a good substitute for fruits in the winter.

No home garden is complete without tomatoes, and both early and late staked crops should be grown.

Lettuce cannot be neglected. There are many other vegetables that can be given attention, such as asparagus, herbs, carrots, parsnips, cauliflowers, and melons.

GARDEN SEED SELECTION.

In selecting and saving seed for future plantings, the most vigorous, healthiest, and heaviest-bearing plants should always be reserved for the purpose. Type and production are essentials that should always be observed.

Various methods are used in the harvesting and cleaning of garden seeds, but the actual principles remain more or less steadfast. Seeds should not be harvested until fully ripe or mature. It is equally important that the crop should be promptly gathered when the proper time has arrived. If seed be left too long on the plant, sprouting or moulding may occur, and the seed, at least, will discolour. This is always objectionable when they are required for commercial purposes. Seeds are generally ripe when the pods or seed capsules turn yellow, or the fruits—such as tomatoes and melons—lose their firmness.

Bright sunny weather should be selected, if possible, for the harvesting of crops which require threshing—such as beans and peas. The plants should be dried thoroughly before threshing, and it is always better to select days of low humidity for this operation. No matter how the seed is threshed, the greatest care should be exercised to prevent breaking the seeds or the seed coats. Winnowing is often necessary for the final cleaning of the seed.

In securing clean seed of such fruits as tomatoes and melons the ripe fruits must stand for some time in their juices to remove the mucilaginous covering. A common method is to throw the cut specimens or the scooped out pulp into any convenient vessel, such as a bucket, tin, or small barrel, and stir daily until fermentation has loosened the covering about each seed. This requires from three to six days. To prevent the discolouring of seeds, the fermentative process should not be continued longer than is necessary.

After fermentation the seeds are separated from the pulp and the skin by washing as often as may be required to obtain clean seeds. The good seeds settle to the bottom of the vessel, while the pulp, skin, and light seeds rise to the top and may be poured off. Three or four washings are usually sufficient, and the use of sieves in this process of separation is recommended.

After winnowing or washing, as the case may be, all seeds must be cured thoroughly before storing. They should be spread in layers upon trays in well ventilated places until thoroughly cured. It is an advantage to wash early in the mornings of bright days to facilitate drying, which should always be done under shade. Seeds may be stored in either cloth or paper bags. The greatest enemy to the preservation of seeds is moisture, but usually the conditions in an ordinary living-room are satisfactory. Provided the seeds are well cured and the humidity remains low ordinary fluctuations in temperature do not affect the vitality of the seed. It is a well-known fact that seeds do not keep well in North Queensland, because of the great amount of moisture in the atmosphere. Some seeds—such as cabbage, turnip, and radish—stand a very great chance of becoming mouldy unless kept in well-ventilated containers.

—*H. J. Freeman, Senior Instructor, Fruit Culture.*

Plate 260.

MORNING IN A BRISBANE GARDEN.—The charm of rockeries, winding paths and palms.

SOME FERTILIZING POINTS.

With the coming of the best rains since March, renewed interest will be taken in the garden, which should be a feature of every farm home. Most soils can be made to produce successful gardens, although the process requires time, energy, some expense, and an appreciation of certain fundamental principles, as well as attention to such important matters as seed and plant selection, and insect and disease control.

Intensive gardening demands a higher degree of soil fertility than does ordinary field crop culture. Not only should an efficient system of soil management make allowance for the present crop, but it should aim at an ever-increasing reserve of fertility. It should determine the necessity and value for the particular soil or organic matter, how most economically to apply this material, then attempt to supplement this where necessary, by liming and the addition of artificial fertilizers.

For the maintenance of fertility the city gardener has to place his chief dependence on chemical fertilizers, and the grower who lacks information as to the plant food content of his soil, and who desires to grow a wide range of crops of whose requirements he knows little, should play safe by using a high-grade "complete" fertilizer, and give a liberal application. Though he applies more than the plants actually require, the increased cost is so slight that the assurance of having enough is worth the additional expense.

A complete fertilizer is one supplying nitrogen, phosphorus, and potash in forms readily available to plants. A generally applicable complete fertilizer for home garden use consists of a mixture of dried blood, superphosphate and sulphate or chloride of potash. These substances in the proportions by weight of 3, 4, and 1 respectively give a 5-11-6 fertilizer, or one containing 5 per cent. nitrogen, 11 per cent. phosphoric acid, and 6 per cent. oxide of potash. On light-textured soils potash could be increased by using the same substances in the proportions of 2, 3, and 1, when a 4-11-8 fertilizer would be obtained.

Dried blood has many advantages as a source of nitrogen. It does not damage seeds or seedling roots; it becomes available when the root system is developing, and therefore is not lost. It is a useful basal form of nitrogen application, carrying plants up to the stage where it may be advantageous to apply forcing soluble nitrogenous fertilizers.

Sulphate of ammonia may be used in place of dried blood in the complete mixture, but should be used in two-thirds the quantity. The use of sulphate of ammonia results in loss of lime from soils, and in time develops strong acidity. These harmful effects are easily overcome by liming, but it is not advisable to use this fertilizer on acid, lime-deficient soils.

The tendency in home gardens is to use quantities of manure without the application of potash and phosphate, and results in a bad nutrient balance, which accounts for the frequent reports of plants producing excessive vegetative growth, with poor flower, fruit, or tuber production. Under such conditions the addition of a mixture of four parts of superphosphate and one of sulphate or chloride of potash would result in a better nutrient balance.

For crops such as lettuce, cauliflower, cabbage, Brussels sprouts, spinach, and celery, where vigorous growth must be maintained, liquid fertilizers can be applied when the plants are well established. The following flowers, provided a complete fertilizer has been used initially, have been found to respond to nitrogenous top-dressing:—Dahlia, chrysanthemum, calendula, Iceland poppy, sweet pea, primula, &c. The soil should be moist before the application of liquid fertilizers.

The most efficient forms of nitrogen for liquid application are nitrate of potash, nitrate of soda, or a mixture of these salts, and nitrate of lime. Sulphate of ammonia, phosphate of ammonia, or a complete liquid fertilizer consisting of nitrate of potash and superphosphate may be used. These substances are soluble in water (superphosphate will leave a considerable residue) and can be dissolved at the rate of 1 to 2 oz. per gallon, and the solution run along the rows from a water-can with the sprinkler removed, or applied with a measure in the case of larger, spaced plants.

If the liquid comes in contact with the leaves, these may be hosed down after the application has been made, to obviate the possibility of injury.

The practice of broadcasting fertilizers is wasteful, since much of it will not come within the absorbing range of roots. When seeds are planted in drills, these should be opened up several inches broad at the bottom and from 1 to 3 inches deeper than the seed is to be placed. The fertilizer then is distributed along the bottom of the row, at the rate of an ounce or two to the yard, the drill filled in to the desired depth, and the planting made.

With large growing plants that are spaced, such as tomatoes, cabbages, and potatoes, a hole a foot in diameter and several inches deep can be made with a spade, and a small handful of fertilizer scattered in the hole before filling in and planting above the fertilizer. Fertilizers for potatoes should be slightly below and in a ring about the tuber, rather than directly beneath it.

FERTILITY OF THE HOME GARDEN.

Intensive gardening demands a higher degree of soil fertility than does ordinary field crop culture. An efficient system of soil management, therefore, should not only make allowance for the present crop but should aim at an ever-increasing reserve of fertility. To achieve this end a plentiful supply of organic matter is essential.

Organic matter improves both the physical condition of the soil and its water-holding capacity. It also helps to modify extremes of soil temperature. In addition to providing some of the better known mineral constituents required by the plant, organic matter provides certain other necessary elements, usually not considered in the preparation of artificial fertilizers. Some heavy acid soils which fissure badly on drying can be improved in texture often by liming and the addition of organic matter.

The richer the food of animals the richer will be their excreta. Urine contains a great deal of the nitrogen and potash but only a small proportion of the phosphate excreted by the animal, and all three substances are in a form which is readily available for the plant. It is important, therefore, to realise that unless precautions have been taken to include the urine with the solid excreta the value of the manure is much less than it should be.

Horse manure is richer than cow manure, since the mineral requirements of the milking cow are much greater than those of the horse.

Poultry manure, when fresh, is a richer fertilizer than horse or cow manure. It contains more than twice as much nitrogen and phosphate, but has only about the same amount of potash. The bulk of its nitrogen is present in an easily available form, hence it is a quick-acting or forcing nitrogenous manure.

Animal manure, as commonly procurable, has not been carefully conserved, and must be regarded as an unbalanced fertilizer which should be supplemented by the application of artificial manures to the crop.

An annual application of 100 to 150 lb. per 100 square feet is necessary usually to maintain the fertility of the garden soil.

—*H. W. Ball.*

SHEEP LANDS FOR GRAZING SELECTION.

WELLSHOT RESUMPTION.

Portions 3 and 7, parish of Hazlemere, comprising part of Wellshot resumption, will be open for Grazing Homestead Selection at the Land Office, Longreach, on Thursday, 2nd December, 1937, at 11 a.m.

The portions are situated about 30 and 43 miles southerly from Longreach.

The areas of the portions are 26,278 acres and 23,075 acres.

The term of each selection will be 28 years and the annual rental for the first 7 years is 4d. per acre.

Each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of 3 years.

Both portions are artificially watered by tanks, but more water will be required. They comprise downs country and are first-class sheep areas, suitable for fattening, woolgrowing and breeding.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Longreach, and the Queensland Government Tourist Bureaux at Sydney and Melbourne.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of years' records.	Sept., 1937.	Sept., 1936.
North Coast.	In.		In.	In.
Atherton	0·72	36	1·19	1·89
Cairns	1·69	55	1·62	4·22
Cardwell	1·54	65	1·15	2·41
Cooktown ..	0·57	61	0·47	0·68
Herberton ..	0·56	51	0·60	0·85
Ingham	1·59	45	1·46	3·75
Innisfail	3·53	56	2·96	6·94
Mossman Mill ..	1·73	24	1·26	7·09
Townsville ..	0·77	66	..	0·21
Central Coast.				
Ayr	1·34	50	0·01	0·11
Bowen	0·81	66	..	0·06
Charters Towers ..	0·81	55	.	0·11
Mackay	1·57	66	0·51	1·08
Prosperine ..	2·10	34	0·99	2·28
St. Lawrence ..	1·27	66	0·05	0·08
South Coast.				
Biggenden ..	1·57	38	0·33	0·69
Bundaberg ..	1·60	54	0·07	1·24
Brisbane	2·02	85	0·20	0·84
Caboolture ..	1·86	50	0·30	0·73
Childers	1·82	42	0·13	0·48
Crohamhurst ..	2·68	44	0·23	1·09
Esk	2·13	50	0·35	1·09
Gayndah	1·58	66	0·52	0·55
Gympie	2·12	67	0·74	0·07
Kilkivan	1·72	58	0·70	1·13
Maryborough ..	1·95	66	0·16	0·18
Nambour	2·53	41	0·32	0·64
Nanango	1·84	55	0·53	0·99
Rockhampton ..	1·31	66	..	0·13
Woodford	2·18	50	0·20	0·43
Central Highlands.	In.		In.	In.
Clermont ..	1·02	66	0·04	0·06
Gindie	1·08	38	0·05	0·11
Springsure ..	1·31	68	0·09	0·26
Darling Downs.				
Dalby	1·69	67	0·66	1·07
Emu Vale ..	1·78	41	0·78	1·59
Hermitage ..	1·58	31	0·75	1·18
Jimbour ..	1·49	49	0·35	1·25
Miles	1·36	52	0·31	0·89
Stanthorpe ..	2·31	64	0·17	1·50
Toowoomba ..	2·14	65	0·59	1·70
Warwick ..	1·83	72	0·76	1·50
Maranoa.				
Roma	1·43	63	0·27	0·44
State Farms, &c.				
Bungeworgorai ..	0·97	22	..	0·25
Gatton College ..	1·58	38	0·20	1·27
Kairi	0·68	21	..	..
Mackay Sugar Experiment Station	1·50	40	0·42	0·94

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·01	81	70	87	22	59	23	47	4
Herberton	..	75	51	85	20	40	6	60	6
Rockhampton	30·15	82	59	91	20	50	23	Nil	..
Brisbane	30·19	77	56	87	19	46	12	20	1
Darling Downs.									
Dalby	30·18	77	48	85	17	34	12, 22	66	1
Stanthorpe	..	69	40	79	29	26	12	17	1
Toowoomba	..	72	48	80	18	32	12	59	2
Mid-Interior.									
Georgetown	30·01	90	62	96	18	52	5	Nil	..
Longreach	30·11	85	55	94	16, 17, 18	43	4	Nil	..
Mitchell	30·16	79	44	96	28	31	12	16	3
Western.									
Burketown	30·02	89	64	94	4	57	6	Nil	..
Boulia	30·07	86	54	100	17	44	2	Nil	..
Thargomindah	30·13	79	52	97	17	42	4, 5, 12	7	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

	November. 1937.		December. 1937.		Nov. 1937.	Dec. 1937.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·3	6·9	4·49	6·31	3·28	3·19
2	5.2	6·10	4·49	6·32	4·4	4·0
3	5·1	6·11	4·49	6·33	4·40	4·44
4	5·0	6·12	4·50	6·34	5·21	5·32
5	5·0	6·12	4·50	6·35	6·2	6·22
6	4·59	6·13	4·50	6·36	6·48	7·16
7	4·58	6·14	4·50	6·37	7·36	8·9
8	4·57	6·15	4·50	6·38	8·27	9·3
9	4·57	6·15	4·51	6·38	9·21	9·57
10	4·56	6·16	4·51	6·39	10·14	10·48
11	4·56	6·17	4·51	6·39	11·9	11·48
					p.m.	p.m.
12	4·55	6 18	4·51	6·40	12·5	12·44
13	4·55	6·18	4·52	6·40	1·1	1·45
14	4·54	6·19	4·52	6·41	1·58	2·49
15	4 54	6·20	4·52	6·41	2 58	3·55
16	4·53	6·21	4·52	6·42	4·2	5·4
17	4·53	6·22	4·53	6·42	5·10	6·8
18	4·52	6·23	4·53	6·43	6·21	7·9
19	4·52	6·23	4·53	6·43	7·29	8·7
20	4·52	6·24	4·54	6·44	8·33	8·55
21	4·51	6·25	4·54	6·44	9·28	9·40
22	4·51	6·26	4·55	6·45	10·20	10·18
23	4·51	6·27	4·55	6·45	11·4	10·56
24	4·50	6·28	4·56	6·46	11·44	11·39
25	4 50	6·28	4·56	6·46	..	..
					a.m.	a.m.
26	4·50	6·29	4·57	6·47	12·20	12·4
27	4·50	6·29	4·58	6 48	12·56	12·42
28	4·49	6·30	4·58	6·48	1·29	1·19
29	4·49	6·30	4·59	6·49	2·4	2·0
30	4·49	6·31	4·59	6·49	2·40	2·42
31			5·0	6·50		3·28

Phases of the Moon, Occultations, &c.

3rd Nov.	●	New Moon	2 16 p.m.
11th "	☽	First Quarter	7 33 p.m.
18th "	○	Full Moon	6 10 p.m.
25th "	☾	Last Quarter	10 4 a.m.

Apogee, 6th November, at 8·0 p.m.
Perigee, 19th November, at 11·0 a.m.

On the 18th a very small partial eclipse of the Moon will occur, of which the ending will be seen in Eastern Australia. When the full Moon is in exact opposition to the Sun, with the Earth between both, our satellite is totally immersed in the Earth's shadow; but when, as on the 18th, it is a little north of the Sun only a very small curve of the circular shadow of the Earth will here be seen on its edge for a short time after sunset.

Mercury rises at 5.10 a.m., 7 minutes after the Sun, and sets at 6.16 p.m., 7 minutes after it, on the 1st; on the 15th it rises at 5.26 a.m., 32 minutes after the Sun, and sets at 7.6 p.m., 46 minutes after it.

Venus rises at 4.0 a.m., 1 hour 3 minutes before the Sun, and sets at 4.24 p.m., 1 hour 45 minutes before it, on the 1st; on the 15th it rises at 3.54 a.m., 1 hour before the Sun, and sets at 4.50 p.m., 1 hour 30 minutes before it.

Mars rises at 9.58 a.m. and sets at 11.42 p.m. on the 1st; on the 15th it rises at 9.49 a.m. and sets at 11.27 p.m.

Jupiter rises at 9.54 a.m. and sets at 11.34 p.m. on the 1st; on the 15th it rises at 9.7 a.m. and sets at 10.49 p.m.

Saturn rises at 3.6 p.m. on the 1st and sets at 3.22 a.m. on the 2nd; on the 15th it rises at 2.8 p.m. and sets at 2.26 a.m. on the 16th.

When, at the beginning of the month, the Southern Cross has disappeared from the evening sky, and of Centaurus only the Pointers are seen above the horizon, somewhat later Argo, the Ship, will arise in the south-east, with its one great light, Canopus, the second brightest of all stars.

At about 9 o'clock, when the Great Square of Pegasus stands four-square on the meridian, the northern constellation Andromeda can be traced by three stars in line with the brightest one on the eastern side of the Square. The star nearest the horizon points westward to the Great Nebula in Andromeda, faintly visible to the naked eye, or in a field-glass, a Spiral Nebula, whose light takes 900,000 years to reach us.

3rd Dec.	●	New Moon	9 11 a.m.
11th "	☽	First Quarter	11 12 a.m.
19th "	○	Full Moon	4 52 a.m.
25th "	☾	Last Quarter	12 20 a.m.

Apogee, 4th December, at 3 a.m.
Perigee, 17th December, at midnight
Apogee, 31st December, at 4 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 38 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

Development of the State's Resources.

REPLYING to a welcome to himself and Lady Wilson by the Parliament of Queensland on their return from Great Britain, His Excellency the Governor, Sir Leslie Wilson, remarked that Queensland possessed resources which were denied to other States in the Empire, but its people had the responsibility of developing those resources so that they could pass on a great heritage to future generations.

"No money is wasted if it is spent in developing such a young State as Queensland, whether it be used for the development of industry, the improvement of transport, or that form of development on which I have always been so keen—furtherance of water conservation and irrigation," Sir Leslie added.

Continuing, the Governor said that Queensland was largely an undeveloped State, with great natural assets, and he was confident that they would develop those assets in the future.

His recent visit to England had left him with two outstanding impressions, the first of which was England herself. To-day she was more prosperous than ever before, and her standard of living was higher than for years past. But those factors were not so important as England's standing in the councils of the world.

She stood firm on a policy of commonsense, determined to do all in her power to avoid a world conflagation similar to that of 1914. Other nations looked to her for guidance, and he was convinced that, as a result of that guidance, the world would avoid the disaster with which it was threatened.

The second impression he had received was of the vastly increased interest shown in Australia, particularly in Queensland. Five years ago few people in England appeared to be interested in the Commonwealth or in this State, but to-day business and commercial men knew much about them and were anxious to know more.

He had returned convinced that personal contacts with England were of outstanding importance to the State and to Australia. Without those contacts, either through visits by representative Australians to England or by representative Englishmen to Australia, the two countries could not hope to know as much about each other as they should.

The Governor pointed out that Queensland was the Empire's youngest State, and added that it also was one of the potentially richest. Money and effort spent upon its development, therefore, were well expended, and he was sure that this was recognised by every member of the Legislative Assembly.

"If we as a people are far-seeing enough and brave enough we shall make this State the finest and the most prosperous of the whole of the Dominions of the British Commonwealth of Nations," concluded His Excellency.

Such visits as that from which the Governor had just returned were of untold value to Queensland and to Australia, said the Premier, Hon. W. Forgan Smith, LL.D., who proposed the toast of Sir Leslie and Lady Wilson. They advertised the State and helped the people in the Old Land to appreciate the achievements and aspirations of the Dominion. Sir Leslie had not missed any opportunity of placing Queensland in the forefront, and of giving the people of England an idea of general conditions in Australia.

Modern transport and communication had brought countries closer together, and any conditions affecting Britain or Europe were immediately reflected in Australia. For example, a decline in Britain's national income meant a decline in prices of Australian exports and a consequent shrinkage of our own national income. For such reasons, it was essential that personal contact between the two countries should be maintained. The peace and progress of the world depended upon knowledge and understanding between the nations.

"I am sure that the whole of the people of Queensland are delighted to welcome Sir Leslie and Lady Wilson back here," said the Premier, "for they are held in deservedly high regard and esteem by all sections of the community."

"The Governor symbolises the type of man who has made Britain's history," said the Leader of the Opposition, Mr. E. B. Maher, who seconded the toast. "We live in an unstable world, and the strength and solidarity of the British Empire is the world's greatest hope for peace. A State Governor is the link between the heart of the Empire and its outlying Dominions."

The Export Meat Trade.

DISCUSSING marketing matters soon after his return from abroad, the Governor said that while in Great Britain he had spent quite a lot of time on Queensland affairs. He had been able to tell people who really mattered, perhaps a little more about Queensland than they already knew. In this he had been able to speak from personal knowledge.

He visited Smithfield market and saw shipments of Australian chilled beef being sold, and talked to a number of dealers, who said that Queensland had made considerable progress in chilled beef export during the last two and a-half years, but still had a long way to go. Supplies must be regulated, as regularity was essential, and a certain quantity of Australian beef should reach the market each week. There should not be periods of glut and scarcity. A fast voyage, not exceeding forty-five days, was also necessary. The experts also told His Excellency that Queensland must adopt a definite policy to raise the standard of the beef cattle herds to produce a well-finished, early-maturing animal. Queensland could not really be satisfied until its beef was comparable with the best from other countries. He had been informed that weight grades were of great importance and that hindquarters of chilled beef should average between 155 and 175 lb. Australia, like every other seller, must establish its market, or, in other words, buy its goodwill, whether in chilled beef or in any other commodity.

Wild Life Preservation.

STATE and shire authorities, field naturalists, and other wise people are stirring up popular interest in wild life preservation. This awakening of interest is vivid and significant, and because of it sanctuaries for native birds and animals are being extended in every district. Whole shires have been proclaimed, but the work of education against the folly of destroying a national asset must still go on. In this work the farmer must share. Proclamations and pious resolutions may stimulate public opinion, but that is not enough. No one could be in a better position than the farmer to help in the preservation and restoration of bird life, by which enormous sums in the aggregate can be saved annually to agriculture, and which otherwise would be lost hopelessly through the ravages of crop-destroying insects. Bird life can thus be considered as a farm asset to be protected rigorously and continuously. No one else enjoys contact with living creatures more than the farmer, and no one can benefit by them more directly.

It has been estimated that there are more than four million kinds of insects in the world, and all of them are of significance to mankind. They are mostly open friends or enemies; few are neutral; all compete with man for the world's food supply. Whether man or bug finally inherits the earth will depend, in the last analysis, on which is the more efficient in obtaining the daily ration. In Queensland, we have found that the biological means of fighting insect pests are among the most effective. Birds are among the best of biological agencies, and that is why the boy with the pea-rifle or the shanghai should be encouraged to test his markmanship, say, on prowling cats "gone bush," and so satisfy his primitive hunting instinct. Therefore, at this time of the year when birds are busily nesting or rearing their young, an earnest appeal is made for active public interest in the protection of wild bird life—one of the cheapest and most effective allies of agriculture.

Groundsel-Bush in South-Eastern Queensland.*

C. W. WINDERS, B.Sc.Agr., Assistant Research Officer.

GROUNDSEL-BUSH or tree groundsel (*Baccharis halimifolia*) is a native of tropical America which first appeared in Queensland towards the end of last century, probably as an ornamental shrub in Brisbane gardens. As early as 1900 it was reported to have strayed from garden culture into the waste places of townships in Southern Queensland and has since gradually extended its range throughout the south-eastern districts until it now occupies some thousands of acres of pasture, forest and waste lands. Beyond the boundaries of the City of Brisbane, within which the weed is very prevalent, groundsel-bush has assumed serious proportions on the North Coast within the Shires of Caboolture, Landsborough, Maroochy and Noosa. The Shires of Pine and Widgee are less heavily infested, whilst light infestations may be expected to be present in shires adjacent to those enumerated. On the South Coast the degree of infestation appears to be light, though a thorough survey may reveal the position to be somewhat worse than casual observation would indicate.

The plant is a perennial shrub or small tree, which has no use in agriculture and which is of very little value for grazing purposes. Much of the groundsel-bush occurring on agricultural and pastoral lands is of a fairly young age and the plants either have not developed beyond a height of about 4 feet and a stem thickness of 1 inch or have been kept in a stunted condition by periodic "brushing." If allowed to grow unhindered the weed may reach a height of 15 feet and attain a stem diameter at the base of 7 inches or more.

The main method of spread of groundsel-bush is by seed. Each "seed" is very small, but is provided with an attachment of hairs which aids in transportation by air. The most prolific spread of the weed is by means of wind-borne seed, but the prevalence of the plant just above the high-water level of streams and drainage canals suggests that dispersal by means of running water may be of some importance. The carriage by people of the showy inflorescences from place to place no doubt also constitutes a common method of spread.

Whilst groundsel-bush is found commonly on vacant allotments about townships and on neglected forest clearings, its most frequent occurrence is in open grasslands, in ringbarked or partially cleared forest, and on abandoned and neglected orchard or crop lands reverting to scrub or forest. So far as could be ascertained in a survey which was by no means intensive the status of groundsel-bush as a weed of agricultural and pasture lands is as set out hereunder.

Groundsel-bush on Cropped Lands.

Practically all of the cropped land within the groundsel-bush-infested districts is devoted to fruits and sugar-cane, and the inter-row and other cultivation associated with the culture of these crops is sufficient to prevent the establishment of most of the seedlings which appear. Occasional instances were noted of groundsel-bush plants developing within the rows of a sugar-cane crop or in open places in the inter-rows after cultivation of the standing crop had ceased. Such cases indicate the need for regular inspections of standing crops and the use of the "grubber." Where simple precautions of this nature are taken the likelihood of invasion of lands under crop is reduced to a minimum.

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* This article is an abridgement of a report submitted to the Hon. the Minister for Agriculture and Stock following a brief survey of the groundsel-bush position in South-Eastern Queensland. Local authorities, community organisations, the Agricultural Bank and various field officers of the Department of Agriculture and Stock provided valuable co-operation.

The menace to crop lands appears to lie in weed rotations and in temporarily abandoned or neglected areas. Cultivated land is commonly thrown out of orchard and other crops and allowed to revert naturally to grass or weeds as a renovation measure. Where groundsel-bush establishes itself in profusion on crop lands in the grass or weed stage of the normal crop rotation, some trouble may be experienced in cleaning the land of the groundsel-bush when cropping is again to be undertaken. Strict supervision of all lands set aside for soil renovation purposes should be exercised and groundsel-bush eradicated as it appears. Neglect to attack the weed in the early stages of its invasion may result in an infestation so dense as to render restoration of the land to crop both difficult and expensive.

The abandoned or neglected area, on which groundsel-bush is permitted to develop unhindered, in some areas appears, almost without exception, to proceed to the stage at which the vegetation consists almost wholly of groundsel-bush in a dense thicket. The reclamation for agricultural purposes of land in such a degraded state presents a difficult problem, and the rather frequent occurrence of groundsel-bush thickets throughout the agricultural lands of the Maroochy River district must be viewed with some concern.

Groundsel-bush on Pasture Lands.

The occurrence of groundsel-bush in pastures of paspalum, Rhodes grass and Kikuyu grass, the use of which has been more or less confined to fertile soil types, is not particularly marked. In most instances these grasses, by virtue of their sod-forming characteristics, form a pasture which is closed to even the most aggressive weeds. Exceptions occur when a poor stand results from the initial planting or when a marked decline in vigor of the pasture or opening up of the stand due to soil exhaustion, drought, improper management, &c., is evidenced. Normally, however, there appears to be no danger of groundsel-bush establishing itself in high-class pastures and depressing the grazing capacity of the land. No doubt seedlings of the weed make their appearance in the inevitable openings which occur in even the most vigorous pastures, but the combined effects of root competition and of grazing of the young weed plants (the latter a corollary of proper grazing practices) ensure the maintenance of a pasture sward with an extreme low proportion of foreign herbage.

Failure to obtain a good strike and rapid development of sown or planted pastures, particularly on "scrub" burns, provides an opportunity for aggressive weeds to take possession of the area. Groundsel-bush, with its facility for mass spread, is well adapted to invade poorly grassed areas which are not protected by topographical or other features from infestation. Some of the most extensive and dense stands of groundsel-bush observed were mass infestations of steep slopes on which the sowing of paspalum seed following a burn was a failure. Fortunately, instances of this nature appear to be infrequent, but the examples seen indicated one aspect of the potential danger of groundsel-bush to good pasture lands.

The employment of severe pasture renovation measures, such as ploughing or drastic harrowing, provides soil conditions suitable to the establishment of groundsel-bush and it appears advisable that farmers should carry out pasture renovation well in advance of the seeding period of the weed, by which time a close sward that will resist invasion should be developed. As an added precaution, renovated areas should be examined at frequent intervals during the few weeks directly following ploughing or harrowing and any groundsel-bush plants dug out.

Plate 261.
Groundsel-bush, showing leaves and inflorescence.

Pasture deterioration due to old age, drought, mismanagement, &c., is conducive to groundsel-bush infestation and many cases were brought under notice in which dairymen occupying farms within range of seed-reservoirs of groundsel-bush were obliged regularly to dig out young groundsel-bush plants from paspalum pastures of an order just lower than first-class. It is the medium and low quality paspalum pasture lands that, of all the valuable lands of the North Coast, are threatened most seriously by groundsel-bush. Many holders of land falling within these categories appear to realise the necessity for unceasing vigilance and the careful farmer usually finds it practicable to control the pest on his sown pasture areas. The employment of control measures tends, however, to become a heavy burden to farmers whose pastures lie within the zone of dense flights of wind-borne seed.

The self-established type of pasture which occurs on ringbarked or partially cleared forest land offers, due in part to its nondescript nature and in part to the loose management usually applied to it, a fairly open field for groundsel-bush establishment. Much of this type of pasture is, however, protected from the weed because of the dryness of the soil. Where the original forest has developed under fairly moist conditions groundsel-bush may be considered a potential menace to the pasture which follows on clearing. On dry ridges no heavy infestations were observed, but the paucity of the weed there may be attributed possibly to the fact that dry, broken, forest country is seldom cleared in any but a light fashion and the shade cast by the green trees is sufficient to prevent heavy groundsel-bush invasion. Where groundsel-bush was observed on dry, forest country it was restricted largely to the edges of the forest or to cleared spaces.

Reclaimed or partly-reclaimed swampy and marshy country appears to be a very suitable situation for groundsel-bush. Only a few thousands of acres of this type of country have been improved for pastoral or agricultural purposes, but it has been found that removal of the green timber and draining predispose the land to heavy groundsel-bush infestation.

Requirements for Groundsel-bush Development.

The climatic conditions required by groundsel-bush for its normal annual development, including seed ripening, appear to be a long, warm summer and an annual precipitation of more than 40 inches of rain, of which most occurs in the summer. These are the conditions experienced in the strip east of the coastal ranges. To the west of the ranges the rainfall may be too low to permit of groundsel-bush developing and spreading, though in "soaks" and other moist places establishment may occur.

The elevational range of the plant is from sea-level, or lower, to the highest points of the Blackall and other coastal ranges. Although the densest and most extensive stands occur at low altitudes, this may simply be due to the fact that the original distributing centre was near sea-level. As a matter of fact, a particularly dense stand of groundsel-bush was observed high up on the Maleny plateau in close proximity to an area where the plant had once been cultivated.

Infestations were observed on all slopes and exposures, but dense stands were seen only in those situations exposed to seed-bearing winds. Close to the coast the prevailing winds at seeding time of the groundsel-bush are south-east in direction and country with a north-western exposure is protected to some extent from wind-borne seed. On the higher parts of the Blackall Range the winds experienced at seeding time have a westerly component and on the lower slopes heavy infestation from the highlands is confined to country facing the west. Although wind-borne seed appears to be the main source of infestation of new areas, transference of seeds by water probably is a channel by which clean areas may become infested.

As previously indicated, groundsel-bush occurs on a wide range of soil types, including rather dry, infertile forest soils, rich volcanic loams and low-lying clay soils with a high moisture content. Though plants of the weed were observed in some very damp situations, permanently water-logged areas appear to be immune from heavy infestation. Nevertheless, soil moisture content seems to be a limiting factor, the most vigorous and densest stands occurring on soils well supplied with moisture. Healthy, well-developed plants occur just below high tide mark near the mouths of several coastal rivers. Some evidence that, other things being equal, eroded soils are more favoured by the weed than are entire soils, was collected, but no definite conclusion was reached on this point. Since the soils within the groundsel-bush-infested region naturally are generally acid in reaction, no information concerning the limits of soil acidity which the plant will tolerate was obtained.

The light requirements of groundsel-bush appear to be high. No infestations were observed in dense "scrub" nor in virgin dense forest. Invasion of these types of timbered land does not occur until the timber is thinned out and abundant light admitted.

Effect of Groundsel-bush on Animal Health.

As a consequence of reports of suspected poisoning of stock by groundsel-bush on the north coast, feeding experiments were conducted at the Animal Health Station at Yeerongpilly some years ago. Two Jersey heifers were fed for thirteen days on a ration of chaff and groundsel-bush leaves in almost equal proportions by weight. Neither animal showed any sign of ill-health other than a tendency to constipation. Three guinea pigs fed exclusively for twelve days on groundsel-bush leaves became greatly emaciated and anaemic and one died, apparently from malnutrition.

Information collected during the course of the recent survey corroborated the conclusions which may be drawn from the feeding experiments. Stock browse groundsel-bush to only a slight extent when ample nutritious grass is available. When grass is scarce the groundsel-bush is grazed, often quite heavily. Animals ingesting large quantities of the weed daily over a long period lose condition and milking cows drop considerably in production. Any effects on the stock appear to be due to malnutrition rather than to poisoning.

Control of Groundsel-bush by Natural Agencies.

The only natural agency which appears in Queensland to exercise more than a slight degree of control over the development and spread of groundsel-bush is climate. To what extent meteorological conditions restrict the weed is not definitely known, but west of the coastal ranges the climate probably prevents establishment and growth.

White wax scale, accompanied by "sooty mould," is a common pest of groundsel-bush throughout its whole range in Queensland, but only in isolated instances has it any marked effect upon the health of the plant. It is possible that infestation by the scale and its associated

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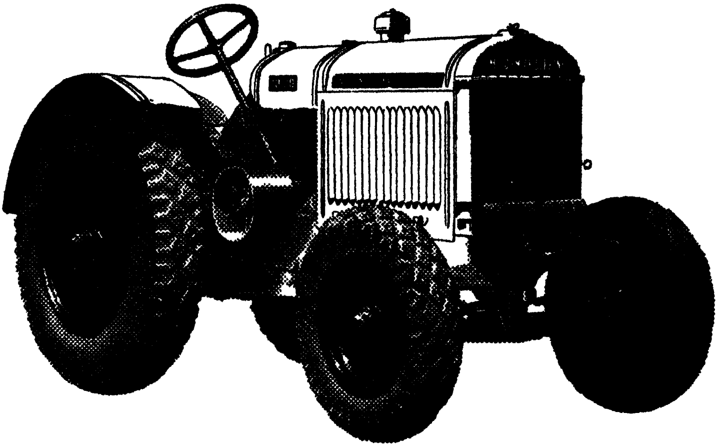

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fungus hastens the end of sickly plants, but vigorous plants of all ages show little ill-effects. White ants have been reported as destroying occasional plants. No pathogenic fungi have been observed to attack the plant, and the only physiological disturbance which has been noted is a die-back of terminal shoots that has been attributed to unfavourable soil moisture conditions.

No information is available concerning the incidence of pests and diseases of groundsel-bush in other countries. Little hope is entertained that biological control will prove feasible, but any attention that can conveniently be given to the matter is warranted.

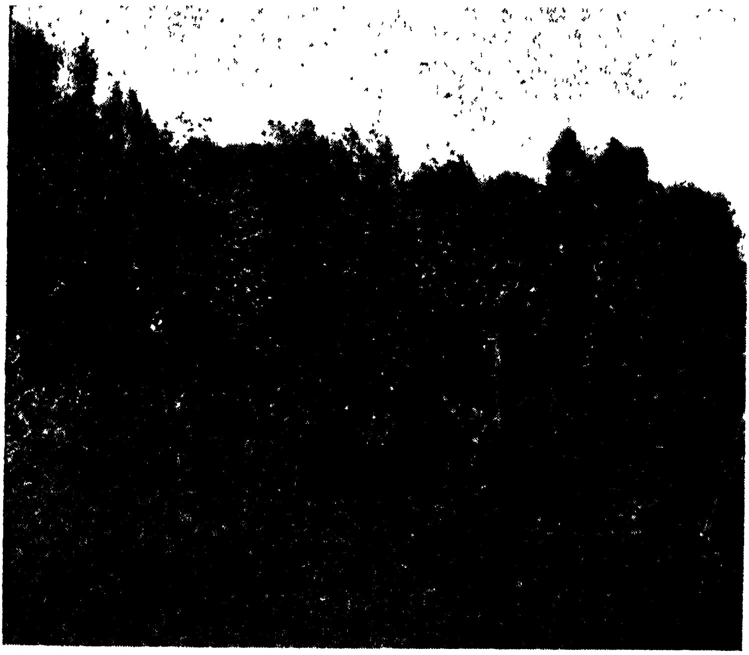

Plate 262.
A coastal pasture invaded by Groundsel-bush.

Mechanical Methods of Control of Groundsel-bush.

Landholders within the groundsel-bush-infested region employ various mechanical methods aimed at the control and eradication of the weed. These include digging ("grubbing"), cutting ("brushing" and mowing), pulling or dragging, ploughing and burning.

Digging.—The use of the "grubber" has been found a fairly effective means of exterminating groundsel-bush on lightly infested land. To prevent regrowth it is necessary to remove all underground parts which are capable of shooting if left in the soil. This is simply done when the plants are young, but older plants may develop a deep taproot, extensive lateral roots, or underground running stems, all of which are difficult to remove entirely.

The eradication of dense stands of groundsel-bush by digging demands the expenditure of a large amount of labour and in some instances, at least, is beyond the capacity of the landholder to accomplish.

Cutting.—"Brushing," with or without subsequent poisoning or "firing," is the commonest method employed for dealing with heavy infestations of groundsel-bush. It is generally held that "brushing" at budding or during blossoming is effective in weakening the plants and many may die. Regrowth is, however, far from eliminated by "brushing" alone, and poisoning or "firing" following "brushing" has been adopted by some farmers. Arsenical solutions swabbed on the butts appear to give a good "kill," but some danger is occasioned to stock. "Firing" a "brushed" area possibly increases the amount of weed destroyed but does not appear to be as effective as poisoning after "brushing."

On one property inspected a standard type of mowing machine is employed on flowering "whip-stick" groundsel-bush plants up to three feet tall and one-half inch or more in stem diameter. The action is, of course, similar to brushing and has approximately the same effects on the plants.

It is probable that cutting frequently during the season of growth would kill the plants, but such a procedure would hardly be economic.

Pulling.—On certain soil types in wet weather or after rain young groundsel-bush plants can be pulled out by hand, but this method of eradication is practicable only on a small scale.

On one heavily infested, lowlying property a tractor-drawn, triangular drag of flanged steel rails has given fairly good results. The apex of the drag is drawn foremost and in sliding between two groundsel-bush plants with large crowns levers them out of the ground. The jolting of the rails also levers out many plants. Young plants with a poorly developed crown are seldom uprooted, whilst a proportion of the well-developed plants escape permanent injury. It has been suggested that a modification of this implement, or a mallee roller, would prove fairly effective.

Ploughing.—Plants which have not attained the stature of a tall shrub or tree can be effectually eradicated by ploughing and subsequent harrowing. Because very little of the pasture land on the north coast is ploughable, only a small proportion of the groundsel-bush-infested country could be so treated.

Burning.—Dense stands of groundsel-bush will take a running fire or a flamethrower fire quite well when the plants are maturing and burning of an area on which there is a good body of grass will cause damage to groundsel-bush plants of all ages, but regeneration from protected portions of the plants is quite common and burning alone does not appear to offer a particularly effective means of eradicating the weed.

Covering.—Though groundsel-bush is intolerant of shade, there seems to be little prospect of successfully exploiting this characteristic for control purposes. The principle of prevention of growth by light exclusion may perhaps be applied in special circumstances by encouraging the growth of, or even by making special plantings of, trees.

Flooding.—An area of groundsel-bush-infested pasture which had been submerged in fresh flood waters for three days some short time after being partly "brushed" was inspected. Both entire and "brushed" plants which were completely submerged during the period of flooding had perished, whereas plants which had been only partially covered or which had suffered immersion for only a short time survived. At the present time the employment of flooding for groundsel-bush destruction is nowhere practicable.

Heavy Grazing.—It has already been remarked that on well-managed pasture areas any groundsel-bush seedlings which appear are destroyed by the stock. One of the requisites is periodical heavy concentration of stock on the area. On undergrazed pastures weed development is encouraged, whilst continuous heavy grazing weakens 'the pasture plants and permits of groundsel-bush intrusion. Stock may, therefore, be used as scavengers of very young groundsel-bush, but on areas heavily infested with woody groundsel-bush plants grazing stock have little influence on the weed.

Chemical Methods of Control of Groundsel-bush.

The only weedicides which are employed in groundsel-bush eradication are arsenical in nature. Arsenic pentoxide is favoured by most landholders because of cheapness and convenience, but proprietary mixtures are used to some extent. Chlorates and other materials non-poisonous to stock do not appear to have been tested.

Arsenical preparations are employed most commonly for swabbing the butts of "brushed" plants and appear to give good results. The method has not been standardised and little information could be secured concerning costs of application.

Some farmers have used arsenical preparations in the form of sprays. Penetration of the poison is declared to be less efficient than might be desired. This may be due to run-off from the smooth leaf and stem surfaces (in which case a spreader is indicated), or it may be the result of high resistance offered by the plant surfaces to the action of corrosive substances, calling perhaps for the addition of concentrated sulphuric acid or some other strongly corrosive material to the arsenical solution.

The best time of application of sprays to groundsel-bush appears to be in late summer, towards or during the blossoming period, but the information obtained on this point was suggestive rather than positive. Young suckers which appear after "brushing" or burning are said to be very susceptible to destruction by sprays at any time of the year, as also are seedlings.

Resumé of Practical Control Measures.

The small-scale spread of groundsel-bush may be checked if landholders of all descriptions dig out the occasional plants as they appear on their properties, and eradicate by digging any adjacent small patches which may be acting as breeding grounds. (In several localities grazing farms were examined which were infested to the extent of only a few bushes, yet these were allowed to remain to constitute a potential source of wholesale spread.)

The treatment of existing stands will vary according to circumstances, though it must be confessed that the control and destruction of dense infestations presents, in many instances, a task of considerable magnitude. Infestations of medium to high density do not appear to be controllable (except to the extent of preventing seed-setting) by simple mechanical measures such as digging, pulling or infrequent cutting, nor does the encouragement of natural enemies offer much promise.

The use of a weedicide seems definitely indicated, and until some treatment combining efficacy, economy and safety is elaborated the use of arsenic pentoxide dissolved in water might be advocated for dealing with infestations rather too dense to warrant the employment of manual methods of eradication.

Some community effort to eradicate, or to eliminate the potency of, breeding grounds on public roads, &c., and on abandoned properties might be urged. This could take the form of destruction of colonies or of cutting back prior to seeding. Such action is particularly desirable where the occurrence of the weed is a menace to clean areas.

Summary and Conclusions.

Groundsel-bush is an American weed which, since its escape from garden culture over thirty years ago, has invaded some thousands of acres of agricultural, pastoral and waste lands in the coastal portion of south-eastern Queensland.

Though cropped lands are as yet not extensively invaded by the weed, a task of some magnitude lies in the reclamation of numerous temporarily abandoned and neglected areas on which a dense infestation of groundsel-bush occurs.

Vigorous pastures of the sod type are little affected. Fertile pasture land on which a poor cover of grass has followed sowing or on which the pasture has been opened up by drought, mismanagement or old age is fairly readily invaded and a considerable area is infested to some extent.

Except for the small proportion which occurs on moist soils, the self-established pastures of medium to low class forest country have not suffered a heavy infestation, although further destruction of the existing timber may lead to increase of the groundsel-bush.

Reclaimed or partly-reclaimed swampy or marshy country offers a very suitable habitat for groundsel-bush and serious infestations occur on this type of country.

The effect of groundsel-bush invasion of pastures is to lower pasture production and to undermine the health of stock forced to graze upon the weed.

Though groundsel-bush is attacked by one or two natural enemies, these appear to have but little effect upon the plants and to exercise only slight control of their development and spread.

Various mechanical methods of treatment of groundsel-bush are effective in eradicating light infestations, but some form of chemical treatment appears to be indicated for the control and eradication of dense stands.

The critical investigation of control measures applicable to existing dense stands seems to be warranted.

Yellow Spot Disease of Pineapples.*

H. K. LEWCOCK, M.Sc., Senior Research Officer.

YELLOW spot was first recognised as a specific disease of pineapple plants in 1926 when it made its appearance in Hawaii on the island of Oahu, but a description of the disease was not published until five years later.[2] For some time the disease was confined to the Hawaiian Islands. In 1928, however, it made its appearance in the Philippines, having probably been introduced there in planting material obtained from Hawaii.[6]

For six years following the first published account of yellow spot nothing even remotely resembling this disease was found in Queensland pineapple plantations, notwithstanding that the insect which transmits the disease from plant to plant, namely *Thrips tabaci* L., was known to be prevalent on pineapples in Queensland even before the disease was reported from Hawaii. Early in October of this year, however, a diseased pineapple fruit was submitted for report from a grower in the Mary Valley and the disease symptoms present in this fruit appeared to be identical with those which have been described for a particular phase of yellow spot disease in Hawaii. This tentative diagnosis was verified by an inspection of the plantation from which the diseased fruit had originated. During the course of this inspection, the characteristic foliage symptoms of the disease were clearly recognised on the leaves of affected tops and in nearly all cases these leaf symptoms were associated with necrosis (breaking down) and decay of the apical fruit tissues.

This outbreak of yellow spot disease which, as yet, is the only one to have been observed in Queensland, was confined to the tops of maturing fruit in a two-year-old plant crop field. At the time the field was inspected most of the fruit had already been harvested, but of those remaining, between one and two per cent. were affected with the disease, mostly to an extent which rendered them valueless. In Hawaii, yellow spot affects young plants which have been propagated from tops to an even greater extent than it does the tops of maturing fruit. However, no top plants of a susceptible age were located in the vicinity of the affected plant crop field in the Mary Valley and it is not yet known to what extent the disease may affect young plants under Queensland conditions.

Description of the Disease.

The progressive stages in the development of yellow spot disease have been described by Illingworth[2] as follows:—"The first appearance of the disease, the so-called "initial spot," is a slightly raised yellowish spot on the upper surface of the leaf. It varies in size from ⅛ to ½ inch in diameter. When fully developed, the darker centre is surrounded by a halo of yellow (Plate 263, fig. A.). Ordinarily, only one leaf is affected, but as many as five initial spots have been found on a single plant. When the spot makes its appearance it is 3 to 8 inches from the base of the leaf. This is due to continued basal growth during the fairly long incubation period. After infection takes place in the axillary region (white tissue) of the leaf, ten days to two weeks must elapse before the yellow spot is apparent. The rate of growth of the individual plant determines the distance up the leaf at which the initial spot appears. All the evidence goes to show that the insect infection takes place near the centre of the plant or top, since the initial spots appear on the leaves of the third or fourth whorls from the centre.

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* Pineapple growers are requested to maintain a careful lookout for plants or fruit affected with disease symptoms resembling those described in this article. In particular, plantings made from tops should be kept under close observation. Plants or fruits suspected of being affected with yellow spot disease should be forwarded to the Department of Agriculture and Stock for examination in order that data may be obtained regarding the distribution of the disease in this State.

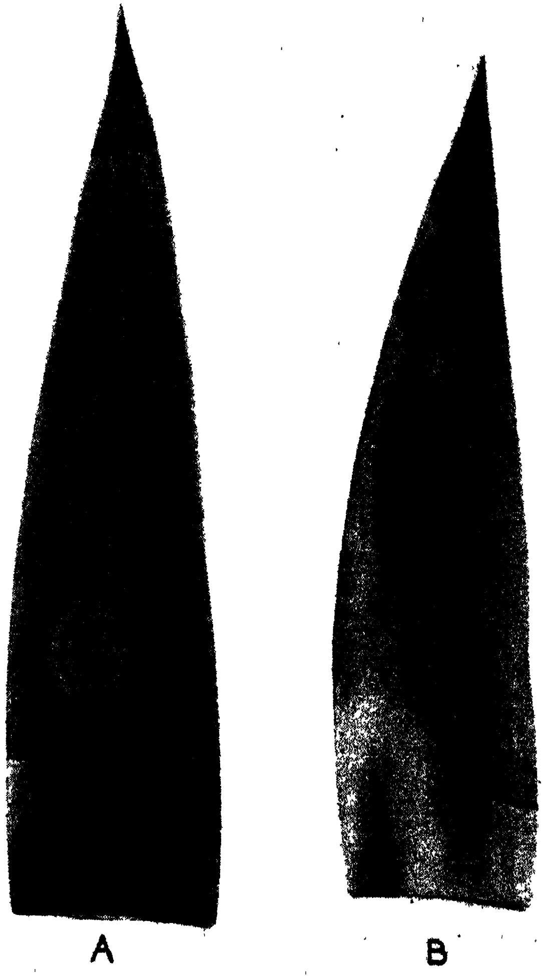

Plate 263.

Fig. A.—Early symptom (initial spot) of yellow spot disease on a leaf taken from an infected top. Note the characteristic halo.

Fig. B.—Yellow spot symptoms on a leaf produced above the "initial-spot" leaf. Note the typical chlorosis and the brown necrotic streak extending towards the base of the leaf.

"Under favourable conditions, a yellow streak develops directly below the initial spot, widening in the region of the white tissue at the base of the leaf. The tendency of this streak is to become constricted into circular yellow blotches, giving it the appearance of a chain of beads. These usually start an inch or more below the initial spot. After a few days the portion of the streak in the white tissue at the base of the leaf has a water-soaked appearance. In the presence of moisture in the leaf axils, rot soon follows, extending to the stem. A few days later a yellow streak, developing into the characteristic bead-like chain,

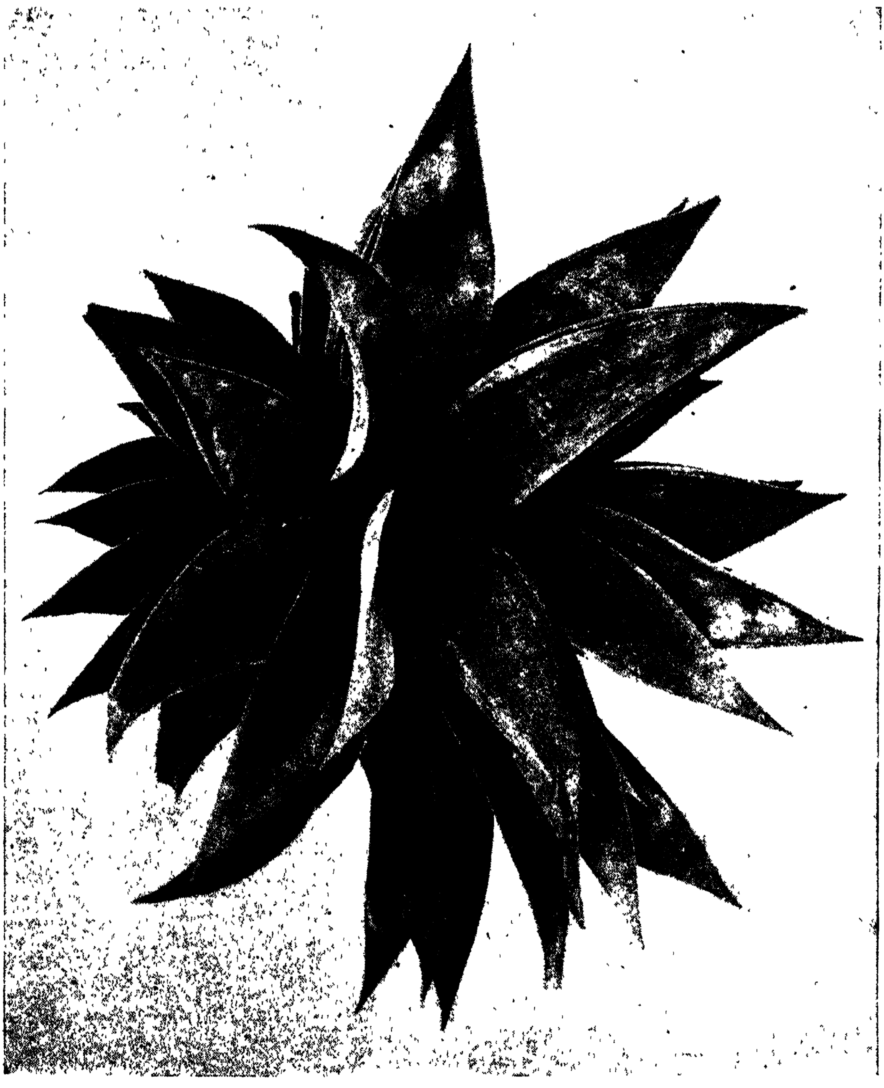

Plate 264.

Yellow spot symptoms on a pineapple top. Note the chlorotic areas and the bending over of the central leaves towards the infection point.

can be observed extending up the next leaf above the one first affected. This usually spreads quickly to the other central leaves . . . . (Plate 263; fig. B.)

"At the point where the base of the young plant (or top) is affected, the tissue ceases to grow. The normal development of the healthy tissue on the opposite side soon causes the plant (or top and fruit) to bend over very decidedly (Plates 264 and 265). This led to the name 'side rot' first being used to designate the trouble."

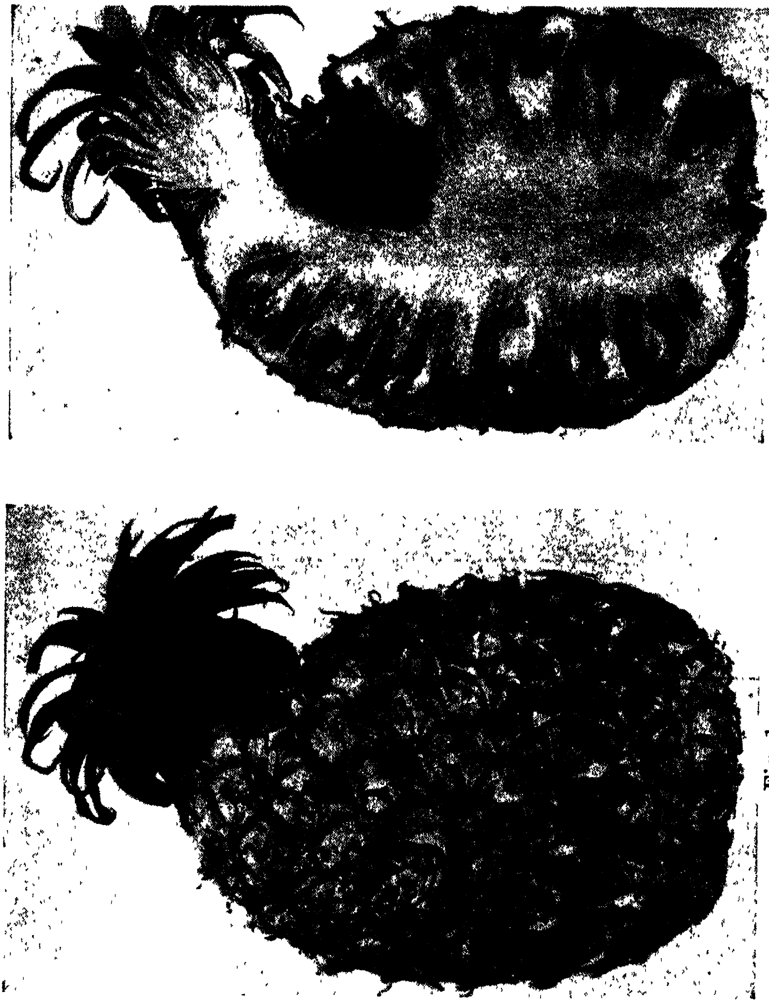

Fig. 2.

Fig. 1.

Plate 265.

Fig. 1.—A smooth Cayenne fruit affected with yellow spot. Note the characteristic lop-sided development of the fruit. Fig. 2.—Fig. 1 cut lengthwise to show the extent of the injury which the disease has caused in the fruit tissues. Note that the point of infection was at or near the base of the top.

If weather conditions remain favourable, a plant or top affected with yellow spot eventually rots and dies. Depending on the age of the plant, the succulence of its tissues and on seasonal conditions, this may take anywhere from two weeks to two months from the time the initial symptoms of the disease make their appearance. If tops become affected while they are still attached to the fruit, further progress of the disease may be arrested by cutting them off at the first appearance of infection. If the causal agent of the disease invades the fruit, the tissues of the core and adjacent fruitlets break down and a brown rot develops.

Infection may also occur in a flower or young fruitlet in the same manner as in a young plant or the crown of a fruit.[6] This type of infection is usually confined to two or three adjoining "eyes" on one side of a fruit; in many cases only a single "eye" will be involved. Cessation of growth in the infected region results in an uneven rate of development on opposite sides of the fruit, causing it to bend over towards the point of infection. (Plate 265.) In the advanced stages of the disease, the affected tissues may dry out, leaving a cavity. The destruction of the diseased fruit tissues is frequently accelerated by saprophytic organisms such as species of *Penicillium*, *Fusarium*, and *Saccharomyces*. In Hawaii, this phase of the yellow spot disease is known as the "Kauai disease," since its symptoms bear a close resemblance to those recorded by Lyon for a disease of pineapple fruits which appeared on the island of Kauai in 1915.[4]

In Hawaii, heaviest losses from yellow spot disease occur in young plantings of tops (crowns), and also in fruit which have been rendered valueless through infection of their apical tissues from affected tops. Illingworth considered that the reason why plantings of crowns are more susceptible to yellow spot than those of slips or suckers was because the looser structure of the former affords the disease-transmitting insect easier access to the tender white tissue in the leaf axils where infection occurs. Other investigators, however, express the opinion that the greater susceptibility of young top plants to the disease is due to the comparatively greater succulence of their leaf tissues during the early stages of growth. In this connection it is interesting to note that while plants grown from tops—and to a lesser extent those grown from slips—are most susceptible between the ages of three and nine months, those grown from suckers are rarely affected with the disease at any stage of their growth.

The Role of *Thrips tabaci* L. in the Transmission of Yellow Spot.

Like bunchy top of banana, yellow spot of pineapples is a virus disease which is spread from plant to plant through the agency of an insect. As previously mentioned, the insect vector for yellow spot disease is *Thrips tabaci* L., commonly known as the onion thrips. This minute insect has a world-wide distribution, and is known to attack a wide range of both crop and weed plants. On the pineapple plant it causes mechanical injury to the white tissue at the base of the leaves, not only through feeding, but also by puncturing the epidermal layers with its ovipositor. However, the ill-effects arising from these injuries are negligible unless the insect inflicting them is infective with the yellow spot virus. In this latter case, the initial spot from which the disease takes its name will appear around or adjacent to the injury in about twelve days from the time the injury was inflicted. Ovipunctures occur as minute brown dots; they do not always occur within the yellow spot itself, and generally there are none at the centre of the spot. On the other hand, a feeding injury usually extends as an irregular brown line directly through the centre of an initial spot.

Linford,[3] who has made a very thorough study of the transmission of the pineapple yellow spot virus by *Thrips tabaci*, has found that the insect transmits the virus to and recovers it from several other plants in addition to the pineapple. The most important of these, because of its wide distribution and the fact that it is a favoured host of *Thrips tabaci,* is the weed known as *Emilia sagittata.* On this plant the disease produces symptoms which involve, in addition to mottling, a distinct tendency towards ring spot, with zonate, circular, chlorotic patterns strongly suggestive of the disease as it occurs in the pineapple. A species of *Emilia* closely related to the one which occurs in Hawaii, as well as other weed hosts of the virus, notably *Sonchus oleraceus,* the sow thistle, are widely distributed in the pineapple districts of Southern Queensland, and this considerably complicates the problem of control in these areas. Up to the present, however, symptoms suggestive of yellow spot disease have not been found on any of the plants, other than the pineapple, which have been recorded as hosts of the virus in Hawaii.

The yellow spot disease may be transmitted from plant to plant through the agency of a single insect; the larger the number of infective individuals, however, the greater is the number of plants or fruits which are likely to become infected. All thrips which feed on a diseased plant may not become infective. Linford has shown that while larvæ become infective after feeding on a diseased plant and that while these individuals remain infective throughout their entire life cycle, thrips which feed on diseased plants for the first time during their adult stage never acquire the power to transmit the virus. Before a thrips larva can transmit the infection, however, approximately ten days must elapse from the time that it first fed on a diseased plant. This period closely approximates to the total duration of the larval stages of this insect.[5]

It is not yet known whether species of thrips other than *T. tabaci* may transmit the disease, but in Hawaii it is considered that this species is the chief vector, since it is the one most commonly observed on weed hosts of the virus.

Climate in Relation to the Occurrence of Yellow Spot Disease.

Climatic conditions play an important role in determining the severity of occurrence of yellow spot disease in pineapples. Even after the initial spot makes its appearance, further progress of the disease is influenced greatly by weather conditions. Humid conditions hasten the development of the disease, while prolonged dry weather retards it. In Hawaii the disease occurs chiefly during the winter and spring months, i.e., the rainy season.[2] New infections are rarely encountered during midsummer, but they usually begin to appear again in young plantings about December (early winter). Following the discovery of the disease on the island of Oahu in 1926, it spread gradually to other islands of the Hawaiian Group, the last island on which it made its appearance being Kauai, in 1930. At the present time the severity of the disease is much worse on this lastnamed island than on any of the others, and this appears to be related in part to the fact that climatic conditions on Kauai are considerably cooler and wetter than elsewhere in the group, due to its more northerly latitude. Next to the plantations on Kauai, those on the uplands of Oahu are affected worst. On Lanaii and Molokai, where the plantations are chiefly located in low-rainfall areas, the disease is of little consequence.

Insufficient data is available to indicate the probable effect of Queensland climatic conditions on the seasonal incidence of the disease, or the extent to which it may develop under these conditions. However, in view of the fact that spread of infection from the only outbreak of yellow spot which has yet been recorded in this State appeared to have been arrested some time previous to the beginning of October, it seems likely that, as in Hawaii, development of the disease will be markedly retarded during prolonged dry periods.

Plate 266.

Control of yellow spot disease by removal of tops from maturing fruit. Photograph taken in Hawaii on the island of Kauai, June, 1936.

In Hawaii, a very definite relationship appears to exist between the incidence of yellow spot disease and the direction of prevailing winds.[2] Plantations situated on the leeward side of affected pineapple fields or weed-infested areas are likely to suffer severely from the disease during their early stages of growth, particularly if tops are used as planting material.

Control Measures.

Complete eradication of yellow spot disease from an infected area does not seem to be a practical possibility, since some of its weed hosts are able to exist for long periods in a diseased condition and thus provide continuous sources of infection. As Linford[3] says:—"Were it not for *Emilia* and other hosts of the virus, the pineapple yellow spot might be self-exterminating, since the pineapple plant affected with yellow spot soon dies. Consequently, transmission of the virus in diseased planting material within an infected region is not of serious importance and roguing is not needed as a control measure. Dead and dying plants are removed from fields simply to make space for replants. It is the movement of infective thrips from other hosts of the virus that accounts for the appearance of this disease in the pineapple."

Owing to the practical difficulties involved in controlling yellow spot by (*a*) elimination of the sources of infection or (*b*) destruction of the transmitting insect, reliance has to be placed on other methods of crop protection. It has been found that losses of young plants from this disease may be reduced to negligible proportions by planting only slips or suckers, while fruit losses may be avoided by cutting off infected tops as soon as the first symptoms of the disease appear in them. (Plate 266.) These are the only methods of control which are being employed in Hawaii at the present time.

Carter[1] has reported that it is possible to obtain a marked reduction in the incidence of the disease in young pineapple plants by frequent applications of tobacco dust. This reduction is believed to be due to changes induced in the plant as a result of the tobacco dust applications, since it was observed that these applications retarded and toughened the growth of very young plants. Since there appears to be a definite relationship between succulence of growth and susceptibility to yellow spot disease, Carter considers that retardation of growth is primarily responsible for the control achieved by tobacco dust applications. He points out, also, that if this conclusion is valid, then it must be remembered that a good many other factors might retard plant growth in the early stages with a similar effect on susceptibility. However, in view of the proved effectiveness of the simple measures already described, the use of tobacco dust for the control of yellow spot does not appear to be either necessary or economically justifiable at the present time.

With the discovery that *Thrips tabaci* was the transmitting agent of the yellow spot virus, the research organisation of the Hawaiian pineapple industry immediately gave attention to the problem of controlling the disease by biological means. Insect parasites of thrips have been introduced into Hawaii from a number of other countries, but as late as 1936 none of these had become established to an extent where they could be regarded as an appreciable factor in the control of yellow spot disease.

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Little Leaf of the Apple.

A PROGRESS REPORT.

R. B. MORWOOD, M.Sc., Research Officer.

A DISEASE of the apple referred to as little leaf or rosette was recorded from the Stanthorpe district in 1928. At that time only a few isolated trees were affected, but a few years later it had assumed serious proportions and has been spreading with ever-increasing rapidity. The symptoms correspond to those of the disease described as little leaf from the States of California and Washington in America and from South Africa. The response to zinc treatment reported below establishes the identity of the Queensland disease with that responding to similar treatment overseas.

Symptoms.

The symptoms of little leaf are most conspicuous in the spring, when abnormal growth develops from the top buds of one or more leaders. The development of small leaves and short internodes results in rosettes occupying the place of normal shoots. The colour of the foliage is considerably lighter than that of healthy leaves, and mottled chlorosis of fully developed leaves is frequently associated. Little leaf buds burst later than normal ones and only develop slowly, in fact the season's growth may be barely measurable in severe cases. In the early years of attack on a tree there occurs an apparent recovery with the second burst of growth which normally occurs in apples at Stanthorpe in December or January. At that time a bud below the terminal rosettes develops and grows strongly for the remainder of the growing season. If, however, the leader is cut to this growth at the following pruning, then it develops little leaf in the next season, and a continuation of this policy results in progressively weaker growth and shorter leaders. In severe cases growth practically ceases and a small misshapen tree bearing little or no fruit is the final result. Prior to the appearance of definite symptoms little leaf can sometimes be detected by the cessation of growth of leaders on otherwise vigorous trees.

Young or old trees appear equally liable to the disease, but it is most readily recognised on vigorously growing trees where marked differences between healthy and affected portions occur. On non-vigorous trees the normal small size of the leaves and shortness and thinness of internodes exists in all gradations, and in its extreme form is difficult to differentiate from little leaf.

At Stanthorpe little leaf is primarily a disease of apples, though similar symptoms have been observed in isolated cases on pears and plums. The disease has been observed on a wide range of varieties, on both Seedling and Northern Spy stocks. Observational evidence is accumulating to the effect that the Delicious is somewhat more subject than other varieties and that "reworked" trees are frequently the first affected in an orchard.

Experiments on Control.

Experiments on the control of the disease were commenced in April, 1934, when soil applications of iron, copper, and zinc were tried at rates of 2, 4, and 6 lb. per tree, and cover crops were planted. The crops failed to become established owing to adverse climatic conditions, and no results could be deduced from the soil applications either in the following spring or that of the succeeding year.

In the spring of 1935 a number of zinc triangles varying from 10 to 40 per trunk and 5 per limb were driven into six trees, and three trees were sprayed with a zinc lime spray. Although the sprayed trees made better growth, no definite results could be recorded. The zinc triangles showed little or no effect in the immediate season or that following. In the third season they were associated with a considerable degree of recovery, but the failure to keep track of several check trees in the meantime and partial recovery of others has made definite conclusions from these trees impossible.

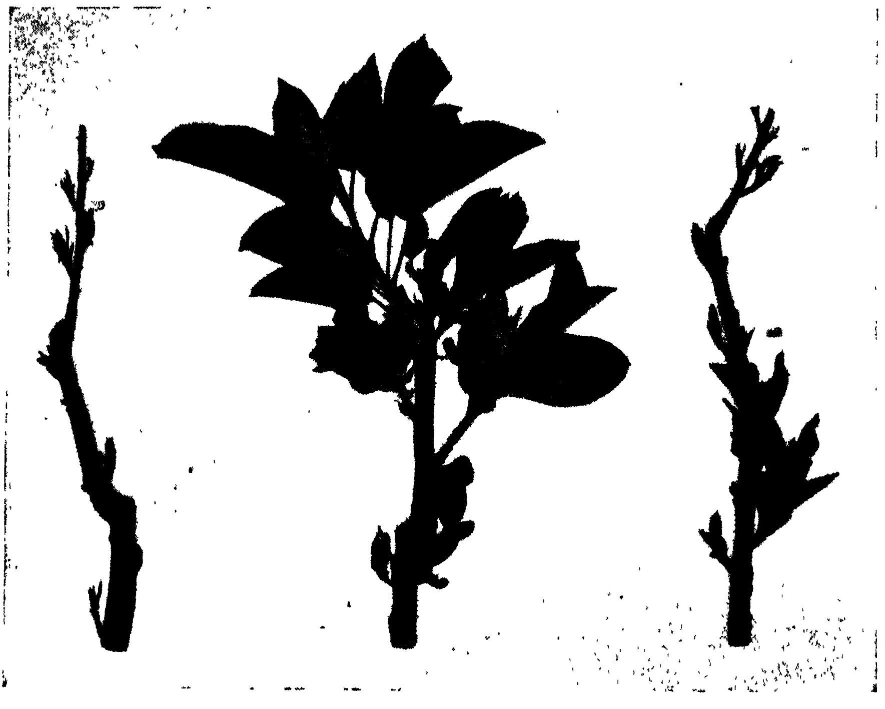

Fig. 1. Fig. 2. Fig. 3.

Plate 267.

TIP INJECTIONS.—Fig. 1. Injected distilled water. Fig. 2. Injected 2 mg. zinc sulphate. Fig. 3. Injected major nutrient elements.

Tip Injections.

In the spring of 1936 tip injection was used for diagnosing a response to zinc. After a preliminary trial with eosin, using also a zinc, and a nutrient solution, the following method was adopted. A spur about 12 inches below the tip of a severely affected leader on a small tree was cut across and connected with rubber tubing to the bottom end of a filtering tube. The tube was supported on a stick secured to the leader lower in the tree. Twenty millilitres of the solution under test were run into the tube and the air released from the rubber tubing.

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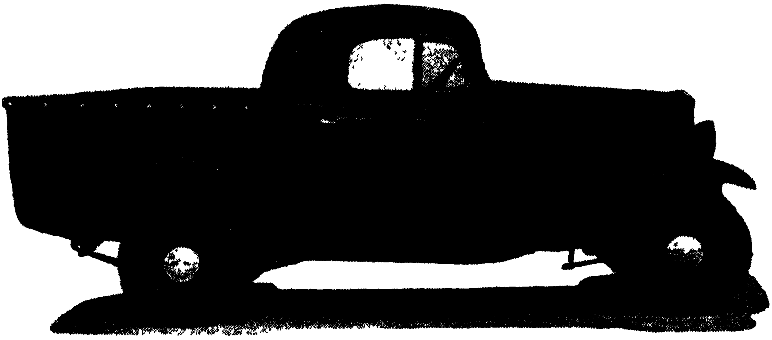

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The apparatus was left till the following day, by which time the solution was absorbed. Twelve leaders were injected in four groups of three, each of which received one of the following solutions:—

(A.)	Zinc sulphate	1 gram
	Distilled water	10 litres
(B.)	KNO_3	1 gram
	$MgSO_4$	0·5 „
	NaCl	0·5 „
	KH_2PO_4	0·3 „
	K_2HPO_4	0·27 „
	H_2O	10 litres
(C.)	Distilled water.	

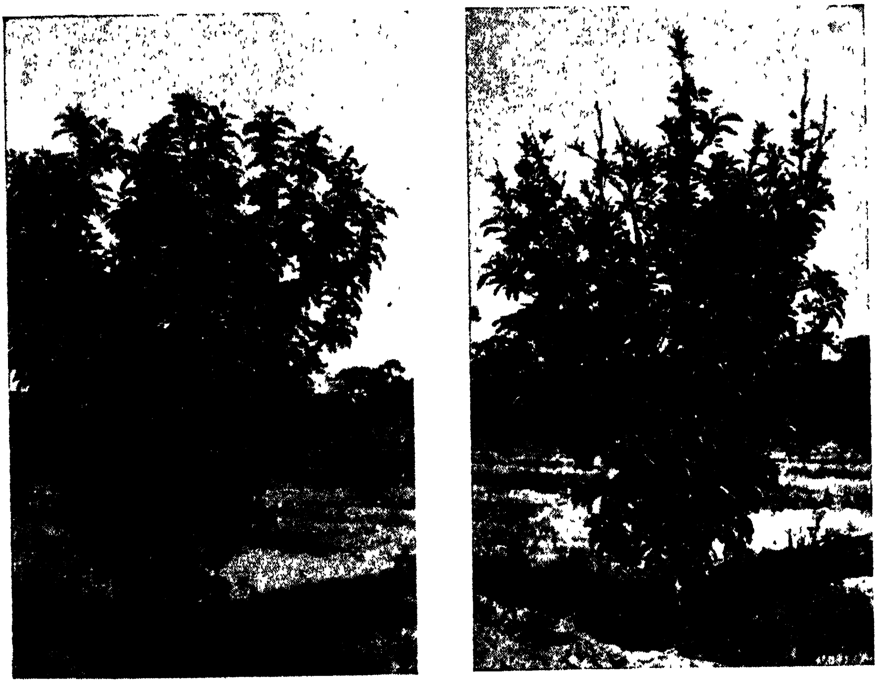


Fig. 1. Fig. 2.

Plate 268.

Little Leaf on Lalla Apple.—Fig. 1. Tree healthy after spraying with zinc-lime. Fig. 2. Unsprayed tree affected with little leaf.

Two months later a small but distinct response to the zinc treatment could be noticed. Buds which had produced only small rosettes were renewing growth on all four shoots injected with the zinc solution. In only two instances (one water and one nutrients) could any growth be detected from the other injected shoots, and this growth was smaller than that with zinc. In the spring of 1937 healthy vigorous growth was produced from two of the zinc injected shoots, the other two showing fair growth. All of the other injected shoots produced only small rosettes (Plate 267).

Spraying Experiments.

Following the initial indications of response to zinc injections, zinc sprays were again tried using an autumn application of 10 lb. zinc sulphate and 5 lb. hydrated lime to 100 gallons of water. An average of ⅘ of a gallon per tree was applied to medium-sized trees. Each plot contained six Lalla and six Jonathan apple trees, and four replications of sprayed and unsprayed trees were used. The Lalla trees were seven years old and particularly vigorous, except that about half of the trees were showing early symptoms of little leaf. The Jonathans were less vigorous, and, in fact, some of them were making very little growth, and consequently little leaf was more difficult to determine with certainty and only a few of the trees were recorded as affected. The sprays were applied on the 1st April, 1937.

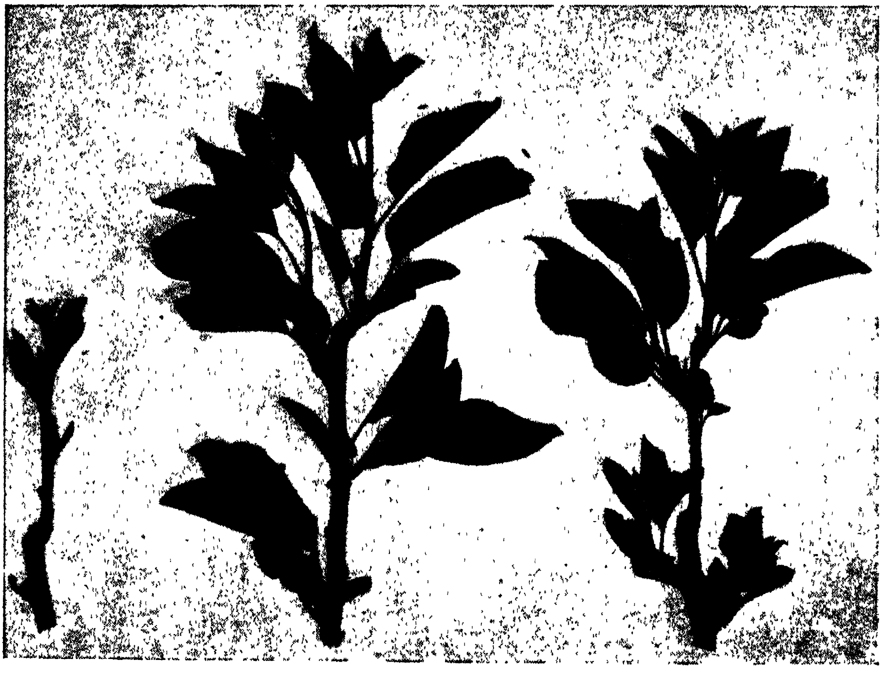


Fig. 1. Fig. 2. Fig. 3.

Plate 269.

LITTLE LEAF SPRAYING EXPERIMENT.—Fig. 1. Leader showing typical little leaf symptoms. Fig. 2 Healthy leader. Fig. 3. Leader which had little leaf in previous season showing recovery after spraying with zinc-lime. Note weak growth for previous year comparable with that of leader in Fig. 1.

Results.

The following spring growth showed obvious differences between sprayed and unsprayed plots in the rows of vigorous Lalla trees in which little leaf was evidently spreading (Plate 268). The sprayed trees were invariably making healthy growth, only portions of the trees most severely affected in the previous season not showing complete recovery (Plate 269). In the unsprayed plots, trees previously diseased showed more severe symptoms, and many trees previously healthy had developed a considerable degree of little leaf. Counts were made of the number of leaders on each tree showing definite little leaf symptoms on the 15th October, 1937. The results in the Jonathan row were not so definite, but the figures suggest a degree of control from the use of zinc spray. In Table I. the average number of affected leaders per tree is given for each variety in each plot, and in Table II. the figures refer to trees grouped according to the severity of the disease in the previous season.

TABLE I.

APPLE LITTLE LEAF. AVERAGE NUMBER OF AFFECTED LEADERS PER TREE.

Variety.	Treatment.	Block I.	Block II.	Block III.	Block IV.	Average.
Lalla	Sprayed	0	0·8	0	1·5	0·6
Lalla	Unsprayed	2·8	6·8	11·5	8·2	7·3*
Jonathan	Sprayed	0·7	0·2	0	0·3	0·3
Jonathan	Unsprayed	0·7	0·5	1	4	1·5

* Differs significantly from sprayed.

TABLE II.

AVERAGE NUMBER OF AFFECTED LEADERS ON THE TREES WHEN THE LATTER ARE GROUPED ACCORDING TO THE SEVERITY OF THE DISEASE BEFORE SPRAYING.

Variety	Treatment.	SEVERE.*		MODERATE.		SLIGHT.		HEALTHY.	
		Number of Trees.	Leaders affected per Tree.	Number of Trees.	Leaders affected per Tree.	Number of Trees.	Leaders affected per Tree.	Number of Trees.	Leaders affected per Tree.
Lalla ..	Sprayed	2	3	3	1·6	3	1·0	16	0
Lalla ..	Unsprayed	2	14	8	11·0	9	7·9	10	4·4
Jonathan ..	Sprayed	0	—	1	2	8	0·4	15	0·1
Jonathan ..	Unsprayed	0	—	0	—	3	0·6	21	1·8

* Extent of little leaf prior to spraying.

Discussion.

The results recorded can be supported by observations of trees where zinc sprays have been tried by orchardists, and the response to zinc treatment is considered to be definitely established. The best method for the application of zinc is still in doubt, as is also the period for which one application will protect the tree, and extensive experiments to elucidate these and other points are being carried out by Mr. K. M. Ward, Assistant Research Officer. In the meantime a consideration of the serious effect on the trees of even one year's delay in the application of control measures would warrant orchardists applying the method which has shown best commercial results to date. This is the application of a zinc lime spray to the trees when in full leaf. The zinc lime spray is made up by dissolving 8 lb. of commercial zinc sulphate in about 70 gallons of water and adding 4 lb. of hydrated lime dissolved in 4 gallons of water while stirring. The mixture is then made up to 80 gallons and is ready for use.

Acknowledgments.

In addition to the assistance received from other Departmental officers, it is desired to acknowledge facilities and help provided by Mr. W. Long, Glen Niven, and by the late Mr. and Mrs. A. H. Paget and Mr. W. Paget, the Summit.

Summary.

The symptoms of little leaf of the apple as it occurs in the Stanthorpe district are briefly described.

Affected trees show a beneficial response to zinc treatment.

Foliage spray with zinc lime 10-5-100 has given commercial control in one experiment.

◆

GROW MORE PASSION FRUIT.

There is a very much greater demand for passion fruit, both locally and for export, than Queensland produces, and as this State grows a passion fruit of the very highest quality, it should be produced to a greater extent than it is. As an occupation on the orchard it is one of the most pleasant. Previously production of this fruit has been undertaken chiefly as a sideline only—a kind of secondary affair which, if it yielded a return, so much to the good; if it didn't, well, it did not matter a great deal. The ever-expanding demand warrants its being made a practical crop and being subjected to kind treatment.

Vines are prone to several diseases which, with proper attention, can be controlled, but which, when the vines are allowed to grow uncared for, quickly destroy them. Due to these diseases and the haphazard method of cultivation frequently employed in the past, the idea has become current among orchardists that vines can be grown only for about two, or at most three years. That this is erroneous is being demonstrated at the present time by vignerons who have made passion fruit growing their main occupation, and who have vines bearing well at seven years of age. These growers, however, prune correctly, and spray at the correct times as advised by the department. They also grade and pack their product for market, and the result is that they are reaping the benefit of an excellent monetary return.

It is stated by some that passion fruit growing entails too much work pruning and spraying, and that the results are not worth it. A careful analysis of the position will refute such statements. Pruning the vine undoubtedly is a tedious and lengthy operation. Spraying also is objectionable, but it should be remembered that citrus growers, grape growers, and practically all other fruit growers must also prune and spray their trees. So far as returns are concerned, good vines produce up to half a bushel of fruit per year. They are usually planted 15 feet by 8 feet apart, or 363 vines per acre. Prices vary from 22s. 6d. per half-bushel during the periods of scant supplies to 4s. 6d. per half-bushel paid by the local factories. From these figures orchardists can estimate for themselves the likely returns. On a conservative average of 3s. 6d. per half-bushel clear of marketing expenses, the return would be £63 per acre per annum. Are there many other fruit crops netting orchardists this sum per acre?

Briefly, for the guidance of those who may be considering planting, it should be remembered that the passion vine is a climber, and thrives in warm, moist situations, preferably in the coastal districts. It grows well on the coastal highlands, like the Blackall Range and Tamborine Mountain, and also on the lowlands between these and the sea. The vine will resist light frosts, but heavy frosts will cause damage.

Reasonable fertile scrub and forest loams, provided they are well drained, are suitable soils, and if a hillside site is chosen it should be well sheltered from heavy winds and preferably have an easterly or north-easterly aspect. It is important that the trellises be strongly made, and that they be at least 6 feef in height.

Two crops are borne each year, a summer and a winter crop, whilst occasionally intermediate crops are borne.

Spring is the best time to plant, though autumn planting is sometimes practised. Spring planted vines sometimes return a small crop the following winter, but the first main crop can be looked for twelve to fifteen months after planting. With autumn-planted vines the first main crop often is not obtained until eighteen to twenty-one months after planting.

A pamphlet giving full cultural details is available free on application to the Department of Agriculture.

Sown Pastures and their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Research Officer.

[*Continued from p. 596, Part 5, Vol. XLVIII.—November,* 1937.]

PART VI.

ANNUAL WINTER FODDER GRASSES.

Oats (*Avena* spp.).

Origin and Distribution.—The various types of oats are native to countries bordering the Mediterranean, but many of the varieties used in Queensland have originated in Australia from imported varieties. The Sunrise oat was selected from a field of Algerian oats (from Algeria) growing in Victoria, and Buddah, Mulga, and Belar oats are selections from Sunrise made in New South Wales. Oats are grown for grain, hay, and grazing in a large number of countries, and have been a favoured grazing and green feed crop in Queensland for many years.

Description.—The oat plant is a tufted, erect, annual plant in which the number of tillers and the nature of the stems, leaves, and seed-head vary with the variety.

Climatic Requirements.—Oats are a winter-growing crop, but by conservation of summer rainfall in the soil and by the use of selected varieties the crop can be grown in many areas with a fairly low winter rainfall.

Soils.—A wide range of cultivated soil types is suited to oat growing. Even fairly wet and sour soils will yield fair crops.

Planting.—Oats are best sown in the autumn, the actual time of sowing depending on weather and soil conditions, the variety to be grown, and the purpose for which the crop is sown. For hay, green fodder, and grazing purposes the late-maturing Algerian oat has in the past been the most popular oat in Queensland, but a range of equally good types is now available. The following are some of the recommended varieties:—

Algerian.—Because of its late-maturing habit, this variety is not quite suitable for dry districts. Where the winter and spring rainfall is satisfactory, Algerian is valuable for hay, green feed, or grazing. It recovers quickly after cutting or grazing, but the young growth is somewhat unpalatable to stock. Early autumn sowing is recommended. In habit it is high-tillering, strong-strawed, and narrow-leaved. It is very susceptible to smut and rust.

Sunrise.—This selection from Algerian oats is very suitable to Queensland conditions. It is particularly useful on the coast because of its resistance to rust. Sunrise is a good grazing oat, and is also valuable for hay and silage. When growing rank it is liable to lodge.

Mulga.—For grazing purposes Mulga is useful for producing an early green feed, but it does not recover well from grazing, and in addition has a short growing season. If a succession of sowings of oats is being made, a late autumn sowing of Mulga will provide a good deal of feed in early winter. It is susceptible to rust.

Belar.—This is a tall, early-maturing oat with wide leaves, and is a good hay and grazing variety. It recovers well after grazing.

Buddah.—This is a tall, sparsely-tillering variety producing a limited bulk of feed. It is not a good grazing variety.

When oats are sown for grazing purposes a sowing rate of 1 to 1½ bushels per acre is recommended. If the crop is to be cut for green feed and not grazed, ¼ to ½ bushel of field peas of the Dun, Grey, or Partridge varieties should be sown in conjunction with the oats to provide a richer feed.

Sowing through the grain drill, the seed being covered to a depth of 1½ to 2 inches, is the best method of planting. Some of the grain runs must be stopped up in order to sow at the required rate. If the seed is hand-broadcast, it should be scattered in the direction of the cultivator furrows and covered by a stroke of the harrows in the same direction.

Plate 270.
Cape Barley and Field Peas.

Management.—Oats sown for grazing should not be continuously grazed, but should be spelled after each grazing to permit of recovery.

Conservation.—A hay of excellent quality can be made from oats, which also furnish a good type of silage.

Feeding Value.—Oats provide very good grazing for milking cows, as well as for fattening stock, if fed in the young stage. Towards maturity the crop loses some of its nutritive value.

Pests and Diseases.—From the grazier's point of view rust is the most serious disease of oats. In some seasons the infestation is so heavy as to render the crop useless for grazing purposes.

Barley (*Hordeum* spp.).

Origin and Distribution.—The cultivated barleys probably originated in Eurasia, where they form a valuable grain crop, and they are grown in many temperate and sub-tropical countries for malting purposes, for hay, and for pasture. In Queensland there is only a limited area grown for grain, but several varieties are commonly sown for fodder.

Description.—The barley plant (Plate 270) is quite typical of the winter cereals, being an erect, tillering, leafy annual.

Climatic Requirements.—Barley is a winter and spring grower, and requires a moderate winter rainfall.

Soils.—Various soil types are suited to barley cultivation.

Planting.—Barley should be sown during the autumn months on well-prepared land, and preferably in conjunction with a legume. A mixture of ¾-1 bushel of barley and 20 lb. of field peas or vetches is recommended. Varieties of barley suited to the district should be used.

Management.—Several grazings may be made during the season or the crop allowed to reach a more mature condition and then cut for feeding green.

Feeding Value.—The palatability and feeding value of barley are good.

Wheat (*Triticum* spp.).

Origin and Distribution.—Wheat, the world's main cereal plant, probably originated in Eurasia, but most countries of the world now cultivate the crop, and the main growing countries have produced types most suitable to their particular conditions. In addition to its use as a grain, wheat is commonly sown for grazing, green feed, hay, and silage, and grain crops are often fed off in their early stages.

Description.—Wheat (Plate 271) is an annual with a fibrous root system. It tillers fairly freely, and the erect stems bear wide leaves.

Climatic Requirements.—All Australian wheat is grown during the winter and spring months. In Queensland selected varieties may be grown in all the agricultural districts, but the chief area growing wheat for grain and other purposes is the Darling Downs. In areas with a higher winter rainfall rust infection is usually high.

Soils.—Most agricultural soils are suitable for wheat.

Planting.—When planted for fodder purposes only, wheat is usually sown in admixture with a legume such as field pea or vetch. The sowing should be carried out during the autumn or winter months, and if desired successional sowings may be made by using a series of varieties. The rate of sowing is ¾-1 bushel per acre of wheat, together with 20 lb. of legume seed.

Management.—Fodder mixtures of wheat and legumes may be either grazed or cut for green fodder. The crop should be given ample time to recover between grazings.

It is a common practice in wheat-growing areas to graze, in the early stages, stands of wheat sown for grain purposes. The stock most usually employed are sheep or dairy cows, and the grazing is carried out either as a part of the normal farm routine or else to check dense rank growth following particularly favourable growing conditions. Three important points in management of this grazing are—

(1) Grazing should not be carried out when the soil is wet.

(2) Even grazing should be effected by grazing small areas for a short time.

(3) Stock should not be grazed on the crop after the production of flowering stems has commenced.

Plate 271.
Wheat and Tares.

Investigations carried out in Victoria demonstrated that grazing should be stopped immediately the first joint of the main stems produced in early spring come within reach of the animals' bite, for it is in the region of the first joint that the miniature flower head lies.

Conservation.—Wheaten hay is one of the most valuable cereal hays, and the crop is also very suitable for ensiling. The grain and offal are valuable stock foods.

Feeding Value.—The young growth of wheat is of high feeding value, and is relished by all classes of stock. The green crop is a useful feed if cut before maturity.

Pests and Diseases.—Stem and leaf rusts are common on many varieties of wheat in some seasons, and reduce the feeding value of the crop.

Rye (*Secale cereale* L.).

Origin and Distribution.—Rye is a native of Europe and Asia, where it is widely grown for its grain. In most temperate countries it is grown to some extent for grazing or green feed, but its use in Australia for these purposes is slight.

Description.—Though resembling the other annual winter cereals in habit, rye has somewhat longer stems and a more extensive root system.

Climatic Requirements.—Rye is able to thrive in cooler and drier climates than the other winter cereals. Its ability to do well under dry conditions is probably due to its root system.

Soils.—Whilst rye does well on the chief agricultural soils, it is also able to thrive on poor and sandy soils. Its adaptation to such soils has been ascribed to its deep and widely-spreading root system.

Planting.—Rye is sown similarly to other winter cereals, but should be planted early. Between 1 and 1½ bushels per acre is sufficient to sow if 20 lb. of vetch or field pea is sown in admixture.

Management.—As a pasture plant, rye is very satisfactory. It produces early winter feed, and can be grazed quite heavily.

Conservation.—Rye is occasionally used for hay and silage.

Feeding Value.—The feeding value of rye approximates that of other small grain crops.

* Seed Canary Grass (*Phalaris canariensis* L.).

Origin and Distribution.—The grass which furnishes the canary seed of commerce is a native of the Mediterranean region. It is fairly widely cultivated in warm, temperate countries for seed purposes, and is used in Queensland both for grain and for grazing.

Description.—Seed canary grass is an annual tufted grass with very soft leaves and a fairly shallow root system. The stems are erect and bear short, ovoid seedheads with a dense formation of flowers. The seed is light yellow in colour, hard and shining.

Climatic Requirements.—Being a winter and spring-growing annual, seed canary grass requires a winter rainfall for its best development. Once established, it is fairly drought resistant, and the climatic conditions of our main wheat-growing areas are quite suitable for its cultivation.

Soils.—The grass requires a fertile soil, such as the basaltic soils of the Darling Downs.

Planting.—The best time for sowing is during May, but sowings may be made up to the end of September. If the seed is drilled in, 8 lb. per acre is sufficient.

Management.—The crop can be grazed once or twice before permitting it to go to seed, or it may be reserved for grazing purposes. The grass is inclined to pull out by the roots if grazed too early. It should not be eaten down too closely.

Conservation.—A good quality hay can be made from seed canary grass, but other cereal hays are preferable.

Feeding Value.—The nutritive value of the grass is very good.

*** A special leaflet on the cultivation of canary seed is obtainable from the Department of Agriculture and Stock.**

Italian Rye Grass (*Lolium multiflorum* Lam.).

Origin and Distribution.—Italian ryegrass is a native of Europe now grown extensively in many temperate countries, including England, United States of America, and New Zealand. In Australia it is used in the Southern States for winter grazing, and is coming into favour in Southern Queensland for the same purpose (Plate 272).

Plate 272.
Italian Rye Grass in the Caboolture District.

Description.—Though occasionally biennial in habit, in Queensland Italian ryegrass usually lives for only one season. It is a tufted, soft, leafy plant, tillering freely and reaching a height of about 18 in. The seeds are borne closely pressed against the slender flower stem.

Climatic Requirements.—A fairly moist winter and spring growing period is necessary for good development of Italian ryegrass. Such conditions are found only in the south-eastern part of the State, and even there not in all years. Frosts do not injure the grass, but long dry periods, particularly during the spring, give the pasture a severe set-back.

Soils.—Italian ryegrass prefers a well-drained, fertile soil, and should not be sown on inferior soil types.

Planting.—The grass should be sown in early autumn (i.e., late March or April), though sowings during May and June may be made if circumstances do not permit of earlier planting and spring feed is desired. Some farmers make a practice of scattering a few pounds of seed of the grass between the rows of the maturing maize crop at the time of final scuffling (Plate 273). The grass develops in the shelter of the crop, and when the cobs have been stripped an excellent pasture is available for grazing by stock. Most commercial lines of Italian ryegrass seed are of excellent germinating capacity and purity. The seed of Italian ryegrass is fine, and a good seedbed is desirable. Only a light covering should be made. Since the grass is an annual, only annual winter-growing legumes or grasses should be sown in conjunction with it. Berseem clover is a good legume to use in the higher rainfall districts. Red clover makes later growth, but balances the pasture in the spring. Vetches and tares are occasionally used. The ryegrass should be sown at the rate of 15 lb. to 20 lb. per acre, with lighter sowings of the legumes (about 5 lb. of Berseem clover or 4 lb. red clover or 10 lb. vetches). Wimmera ryegrass may be substituted for portion of the Italian ryegrass in order to ensure some grazing should rainfall conditions prove just a little too severe for the latter.

Plate 273.
Italian Rye Grass in a Maize Crop.

Management.—Italian ryegrass is well adapted to grazing, but should be grazed intermittently in order to obtain best results. In favourable seasons feed will be available within eight weeks of sowing, and grazings may be made until the pasture dies off in late November or early December. The grass makes a quick recovery after grazing. Italian ryegrass sets abundant seed, and in some years seeds itself down quite effectively if the stock are removed while the seed is ripening and shedding. However, it is inadvisable to rely on self-regeneration, and provision should be made to sow the pasture afresh each year.

Conservation.—An excellent hay may be made from Italian ryegrass, and it also makes good silage if cut when some of its extreme succulency has been lost.

Feeding Value.—On account of its high proportion of nutritious leaf to stem Italian ryegrass is of excellent feeding value and palatability. It is a good fattening grass and an excellent cream producer.

Pests and Diseases.—Italian ryegrass is rather susceptible to rust attack in certain localities.

ANNUAL WINTER-GROWING FODDER LEGUMES, &c.

Field Pea (*Pisum sativum* L.).

Origin and Distribution.—The field pea is a native of Europe, fairly commonly used in many temperate countries for grazing, green feed, and green manuring purposes. In Southern Queensland it is a favourite winter green fodder crop, either alone or in combination with a winter cereal.

Description.—The plants are annual herbaceous trailers, or climbers, with hollow stems. The leaves are feather-like and bear tendrils. The flowers are reddish or purplish, and occur in groups on flower stems at the bases of the leaves. The pods contain angular, greyish seeds.

Climatic Requirements.—The field pea is a winter grower, and does best in cool, moist climates.

Soils.—Fertile soils are necessary, and they must be well drained.

Planting.—Field peas are often injured by the tramping of stock, and so are most useful for grazing purposes when sown with one of the winter cereals. About 20 lb. per acre is sufficient for sowing in mixtures. The crop should be sown in autumn.

Management.—If the mixed crop is to be grazed it should be carefully managed to avoid undue loss. Quick grazings should be made, and stock should be excluded in wet weather.

Often the mixture is cut for green feed, and this practice is usually preferable to grazing.

Bloating of stock may occur if proper care is not taken.

Feeding Value.—Field peas are very palatable to stock, and have a high feeding value.

Vetches and Tares (*Vicia* spp.).

Origin and Distribution.—Of the various forms of cultivated vetch some are natives of Europe, some of Asia, and some of the United States of America. All occur in temperate and warm temperate areas, and in these and similar areas of the world the vetches are commonly cultivated for hay, grazing, green feed, or green manure.

Description.—The vetches are climbing or trailing succulent annual plants with much divided leaves and blue, violet, or white flowers occurring in groups in the axils of the leaves. The pods are flat and contain seeds of a colour varying with the variety.

Climatic Requirements.—Vetches are winter-growing plants, and will make a fair crop on even a rather low winter rainfall. They are affected by hot weather, and die off in early summer.

Soils.—Most agricultural soils are suitable for vetches.

Planting.—Whilst they can be grown alone, vetches are better sown with some upright crop, such as one of the cereals. The mixture is much easier to harvest than the tangled mat of green stuff resulting from an unmixed sowing. In mixtures it is usual to make the cereal the main component and to sow only about 20 lb. of vetch seed in the mixture. Sowing should be carried out in early autumn.

Management.—Mixtures containing vetches may be grazed without much damage to the legume, though it is preferable to cut the fodder and feed it green to stock. When grazed, bloating should be avoided.

Conservation.—Vetches make a good quality hay if cut when in bloom or when the pods are forming, and they may also be ensiled.

Feeding Value.—The palatability and feeding value of vetches are very high.

Berseem Clover (*Trifolium alexandrinum* L.).

Origin and Distribution.—Probably this clover is a native of the Mediterranean region. It is now fairly extensively cultivated in Mediterranean countries, India, and certain parts of the United States of America and other warm-temperate to subtropical countries. In Australia it is used to some extent in the Southern States, and within recent years has come into prominence on the north coast of New South Wales. Sporadic attempts to cultivate the clover have been made in Southern Queensland without marked success, but in view of its usefulness in New South Wales, perseverance is advisable.

Description.—Berseem clover is a tufted, erect-growing annual clover somewhat resembling lucerne in appearance. The stems and leaves are very succulent. The globular flowering heads are borne at the ends of the stems and are yellowish-white in colour.

Climatic Requirements.—Since Berseem clover is an autumn and winter-growing annual, it is necessary for the clover to obtain a fair amount of moisture during the period March to August. Where the normal winter rainfall is less than 12 in. the clover should be planted only on irrigated land or on very retentive soils.

Soils.—In New South Wales the clover is reported to prefer deep clay and clay loam soils on river flats and to be somewhat less successful on red scrub volcanic soils.

Planting.—In most countries where Berseem clover is grown, it is used for hay or for cutting and feeding green. The main objection to its use for grazing is that much waste occurs owing to the trampling of the succulent parts by stock. If it is sown in pasture mixtures this objection is overcome to a large extent. A seeding rate of 8-10 lb. per acre is recommended when the clover is sown alone. In winter pasture mixtures 4-5 lb. per acre should suffice to provide useful winter grazing. Much of the Berseem clover seed on the market is imported from overseas, and frequently contains seeds of noxious weeds. Seed purchases should be submitted to the Department of Agriculture and Stock for examination, before sowing. The seed is of fairly high germinating capacity, and samples germinating lower than 65 per cent. are undesirable.

Sowing of Berseem clover should be carried out in late summer if valuable autumn and winter feed is to be obtained. Early March is, perhaps, the best time. Late autumn sowings do not permit the clover sufficient time to develop properly. Superphosphate sown with the seed will encourage the growth of the plants.

Management.—If the clover is not cut, but is grazed by stock, excessive trampling, with its consequent wastage, must be avoided by grazing off in a very few days and allowing ample time for recovery. The clover is very liable to bloat cattle. Since the clover does not regenerate itself from seed, there is no necessity to provide for seed ripening.

Conservation.—Berseem clover is reported to make excellent hay, but on the coast silage is more suitable. Mixtures of Berseem clover and oats or grasses are said to form good silage.

Feeding Value.—Palatability and feeding value are good.

Rape (*Brassica napus* L.).

Origin and Distribution.—Rape is a native of the Mediterranean region, and is used in many temperate and warm-temperate countries as an annual grazing crop for pigs, sheep, and dairy cows. It is used to only a small extent in Queensland.

Description.—The plant is naturally biennial in habit, but is usually treated as annual. It grows to a height of 2 to 3 ft., and consists for the most part of fleshy leaves.

Climatic Requirements.—Rape is most suitable for cool districts, and requires a winter rainfall for its development. Hot, dry, spring weather kills a good deal of the stand.

Soils.—A well-drained, fertile soil is required by the rape plant, and loams and sandy loams are the most suitable soil types.

Planting.—Rape seed should be sown in the early autumn on a well-prepared seed-bed. If broadcast, 4 lb. of seed should suffice for an acre. The seed should be only lightly covered.

Management.—The crop should be a foot or more tall before the stock are first put on to it to graze. When the plants have been eaten down fairly closely the stock should be removed and the crop permitted to make new growth. The succulent growth has a tendency to bloat ruminants, and appropriate precautions should be taken.

Conservation.—Rape is not a suitable crop for conservation purposes.

Feeding Value.—The succulency of rape renders it very palatable to stock. The plant has a high feeding value, especially for fattening purposes.

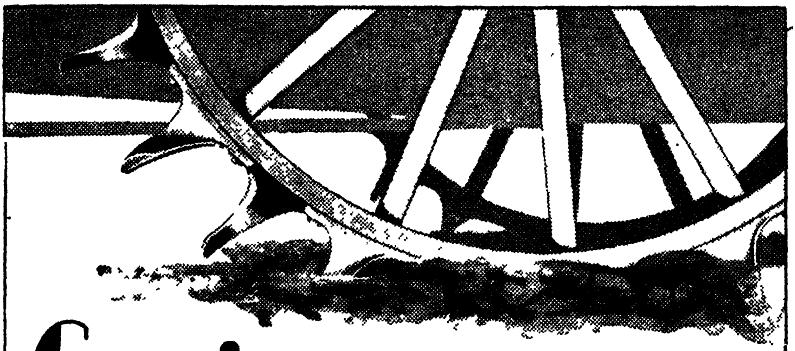
Pests.—Rape is rather susceptible to attack by insect pests, particularly a stem-borer and aphis or green-fly. These insects commonly destroy the whole crop, and for this reason rape is a somewhat unreliable crop to sow.

Special Feature.—Rape is sometimes used for green manure purposes.

Undesirable Features.—In addition to its bloating propensities, rape has a tendency to cause stock to scour rather badly.

CHECK LISTS OF COMMON AND SCIENTIFIC NAMES.

Within recent years important preliminary steps have been taken towards eliminating the confusion which has long existed in the nomenclature of grasses and other pasture plants. A revision of the scientific classification of British Empire grasses is in progress, and when completed will be of great benefit to those concerned with botanical names.



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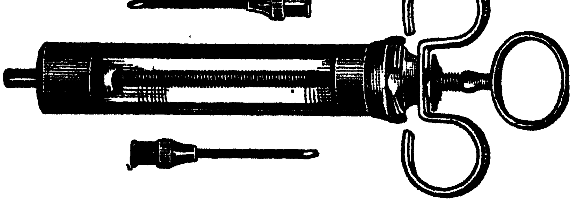

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Similarly, a list of common names which will be accepted by the various agricultural authorities within the Commonwealth is in course of preparation, and farmers and pastoralists will assist in this movement towards uniformity if they adopt the names chosen as standard. Though the list of standard names has not yet been finalised, it is anticipated that those names used throughout the foregoing descriptions of pasture species will be accepted.

The following check lists include only the species dealt with in this series of articles:—

LIST OF GRASSES, &c., BY SCIENTIFIC NAME.

SCIENTIFIC NAME.	COMMON NAME.
GRASSES.	
Brachiaria mutica Stapf. (Syn. *Panicum muticum* Forsk.; *P. barbinode* Trin.)	Para grass, giant couch, panicum, Panicum muticum, Bancroft grass.
Bromus unioloides H. B. et K.	Prairie grass.
Cenchrus ciliaris L. (Syn. *Pennisetum ciliare* Link; *P. cenchroides* Rich.)	Buffel grass.
Chloris distichophylla Lag.	Tassell grass, frost-resistant Rhodes grass, winter growing Rhodes grass, evergreen chloris.
Chloris gayana Kunth.	Rhodes grass.
Cynodon dactylon Pers.	Couch grass, Indian couch, Bermuda grass (U.S.A.), Doub grass (India).
Cynodon plectostachyum Pilg.	African star grass, budgee grass.
Dactylis glomerata L.	Cocksfoot, orchard grass (U.S.A.).
Digitaria didactyla Willd. (Syn. *Panicum didactylum* Kunth.)	Blue couch grass.
Digitaria spp.	Woolly finger and other African finger grasses.
Lolium multiflorum Lam. (Syn. *L. italicum* R. Br.)	Italian rye grass.
Lolium perenne L.	Perennial rye grass.
Lolium (?) *subulatum* Vis.	Wimmera rye grass.
Melinis minutiflora Beauv.	Molasses grass, Wynne grass.
Panicum antidotale Retz.	Giant panic grass, blue panic grass.
Panicum maximum Jacq.	Guinea grass, green panic grass.
Paspalum dilatatum Poir.	Paspalum, golden crown grass, Dallis grass (U.S.A.).
Paspalum distichum L.	Water couch, swamp couch.
Pennisetum clandestinum Hochst.	Kikuyu grass.
Pennisetum purpureum Schum.	Elephant grass, Napier fodder.
Phalaris canariensis L.	Seed canary grass, canary seed.
Phalaris tuberosa L.	Phalaris, Toowoomba canary grass.
Sorghum sudanense Stapf.	Sudan grass.
LEGUMES.	
Arachis hypogæa L.	Peanut.
Lespedeza sericea Mig.	Perennial lespedeza.
Lespedeza stipulacea Maxim.	Korean lespedeza, Korean clover.
Lespedeza striata Hook. et Arn.	Lespedeza, common lespedeza, Japanese clover.
Medicago denticulata Willd.	Burr medic, burr trefoil, burr clover, native trefoil.
Medicago lupulina L.	Black medic, English trefoil.
Medicago sativa L.	Lucerne, alfalfa.
Mucuna spp.	Velvet bean, Mauritius bean.
Stylosanthes sundaica Taub.	Townsville lucerne, wild lucerne.
Trifolium alexandrinum L.	Berseem clover, Egyptian clover.
Trifolium fragiferum L.	Strawberry clover.
Trifolium glomeratum L.	Clustered clover, ball clover.
Trifolium hybridum L.	Alsike clover.
Trifolium pratense L.	Red clover, cow grass.
Trifolium repens L.	White clover, white Dutch clover.
Trifolium subterraneum L.	Subterranean clover, "subclover."
Vigna unguiculata (L.) Wallp. (Syn. *V. sinensis* L.)	Cowpea, Poona pea.

LIST OF GRASSES, &c., BY COMMON NAME.

COMMON NAME.	SCIENTIFIC NAME.
GRASSES.	
African finger grasses	*Digitaria* spp.
African star grass	*Cynodon plectostachyum* Pilg.
Bancroft grass	*Brachiaria mutica* Stapf.
Bermuda grass (U.S.A.)	*Cynodon dactylon* Pers.
Blue couch grass	*Digitaria didactyla* Willd.
Blue panic grass	*Panicum antidotale* Retz.
Budgee grass	*Cynodon plectostachyum* Pilg.
Buffel grass	*Cenchrus ciliaris* L.
Canary seed	*Phalaris canariensis* L.
Cocksfoot	*Dactylis glomerata* L.
Couch grass	*Cynodon dactylon* Pers.
Dallis grass (U.S.A.)	*Paspalum dilatatum* Poir.
Doub grass (India)	*Cynodon dactylon* Pers.
Elephant grass	*Pennisetum purpureum* Schum.
Evergreen chloris	*Chloris distichophylla* Lag.
Frost-resistant Rhodes grass	*Chloris distichophylla* Lag.
Giant couch grass	*Brachiaria mutica* Stapf.
Giant panic grass	*Panicum antidotale* Retz.
Golden crown grass	*Paspalum dilatatum* Poir.
Green panic grass	*Panicum maximum* Jacq.
Guinea grass	*Panicum maximum* Jacq.
Indian couch	*Cynodon dactylon* Pers.
Italian rye grass	*Lolium multiflorum* Lam.
Kikuyu grass	*Pennisetum clandestinum* Hochst.
Molasses grass	*Melinis minutiflora* Beauv.
Napier fodder	*Pennisetum purpureum* Schum.
Orchard grass (U.S.A.)	*Dactylis glomerata* L.
Panicum (North Queensland)	*Brachiaria mutica* Stapf.
Panicum muticum	*Brachiaria mutica* Stapf.
Para grass	*Brachiaria mutica* Stapf.
Paspalum	*Paspalum dilatatum* Poir.
Perennial rye grass	*Lolium perenne* L.
Phalaris	*Phalaris tuberosa* L.
Prairie grass	*Bromus unioloides* H. B. et K.
Rhodes grass	*Chloris gayana* Kunth.
Seed canary grass	*Phalaris canariensis* L.
Sudan grass	*Sorghum sudanense* Stapf.
Swamp couch	*Paspalum distichum* L.
Tassel grass	*Chloris distichophylla* Lag.
Toowoomba canary grass	*Phalaris tuberosa* L.
Water couch	*Paspalum distichum* L.
Wimmera rye grass	*Lolium* (?) *subulatum* Vis.
Winter-growing Rhodes grass	*Chloris distichophylla* Lag.
Woolly finger grass	*Digitaria pentzii* Stent.
Wynne grass (Jamaica)	*Melinis minutiflora* Beauv.
LEGUMES.	
Alfalfa	*Medicago sativa* L.
Alsike clover	*Trifolium hybridum* L.
Ball clover	*Trifolium glomeratum* L.
Berseem clover	*Trifolium alexandrinum* L.
Black medic	*Medicago lupulina* L.
Burr clover	*Medicago denticulata* Willd.
Burr medic	*Medicago denticulata* Willd.
Burr trefoil	*Medicago denticulata* Willd.
Clustered clover	*Trifolium glomeratum* L.
Common lespedeza	*Lespedeza striata* Hook. et Arn.
Cowgrass	*Trifolium pratense* L.
Cowpea	*Vigna unguiculata* (L.) Wallp.
Egyptian clover	*Trifolium alexandrinum* L.
English trefoil	*Medicago lupulina* L.
Japanese clover	*Lespedeza striata* Hook. et Arn.
Korean lespedeza	*Lespedeza stipulacea* Maxim.
Lespedeza	*Lespedeza striata* Hook. et Arn.

LIST OF GRASSES, &c., BY COMMON NAME—*continued.*

Legumes.—*continued.*

Common Name.	Scientific Name.
Lucerne	*Medicago sativa* L.
Mauritius bean	*Mucuna* sp.
Native trefoil	*Medicago denticulata* Willd.
Peanut	*Arachis hypogaea* L.
Perennial lespedeza	*Lespedeza sericea* Mig.
Poona pea	*Vigna unguiculata* (L.) Wallp.
Red clover	*Trifolium pratense* L.
Strawberry clover	*Trifolium fragiferum* L.
Subclover	*Trifolium subterraneum* L.
Subterranean clover	*Trifolium subterraneum* L.
Townsville lucerne	*Stylosanthes sundaica* Taub.
Velvet bean	*Mucuna* spp.
Wild lucerne	*Stylosanthes sundaica* Taub.

[concluded.]

KILLING JOHNSON GRASS.

Mr. W. J. McBaron (Corinda) writes in reference to an article on Johnson grass which appeared in a recent issue of the *Queensland Agricultural Journal,* in which it was stated that if the tops of the grass are kept from shooting by mowing it will be destroyed. Mr. McBaron states that he has seen the soil dug in a trench 3 feet deep, and the soil taken in a face to remove the roots; and, although there were no signs of leaves afterwards, it shot up round the treated area two years after. He also has seen the expedient of building a haystack over a clump of the grass tried, without success, inasmuch as the grass came up round and through the edge of the stack, eighteen months or two years afterwards. In the case of very heavy soil it is possible to kill the grass by ordinary methods.

Mr. McBaron states that, after a good deal of experimenting, he found only one method of combating the pest, and that was by using sodium chlorate as a spray. The destruction of the grass through this medium, however, was thorough and complete, there being not a vestige of either tops, stems, or roots—more correctly, rhizomes—remaining unpoisoned. Mr. McBaron said he had had several inquiries from persons who had seen the effectiveness of that method which he had tried when on a lucerne farm at Harrisville.

Describing this process, Mr. McBaron said two or three sprayings are needed, and from five to six months are required to kill the grass. The sodium chlorate is non-poisonous; but it has been found that clothing which has been wetted by a solution of it will burn like gunpowder when dry, and it is impossible to put it out. The clothes are safe while they remain wet.

One pound of sodium chlorate should be used to one gallon of soft water to which has been added some soap-powder, and this spray should be applied when the grass is old and in head. It is necessary that these three conditions should be observed in order to make the spray adhere thoroughly to the leaves. Spraying should be commenced as soon after Christmas as possible. If it is begun earlier than that the grass will be too vigorous, and if it started much later, there will not be time to finish the "job" before all growth is stopped by the winter. The only effects noticeable after this first spraying will be a slight withering of the leaves and a stooling out from the base. This growth must be caught with the second spraying as it comes to head; and, in a few weeks, all the roots will begin to die back, commencing with the points and the destruction of all the eyes along the roots. If the plants are let alone, it will be found that by the spring the parent stool will be dead and all the roots dried up. As a rule, no third spraying will be needed, except for the odd pieces which always are missed. Care must be taken not to overlook any of these, as otherwise all that has been done will be useless. If it is only a small patch on which the Johnson grass is growing, the seed heads should be reaped as soon as they have formed; but, if this is not done, care should be taken not to let any seedling grass get a hold in the following spring. Ordinary cultivation will kill the seedlings, as in the case of other grasses, if dealt with at an early stage.

A New Weed on the Darling Downs.

W. D. FRANCIS, Botanist.

WITHIN the last few months a new weed of the legume family has appeared on the Darling Downs in a lucerne field at Kingsthorpe. This weed has been determined botanically as *Astragalus hamosus*. This is the first record of the occurrence of a species of *Astragalus* in Queensland. The genus *Astragalus* is an extraordinarily large one, comprising over 600 different kinds or species. These species occur in different parts of the world such as Eastern Asia, Europe and North America. Among these numerous species are some notorious poisonous plants such as several of the loco weeds of North America. Wholesome species also exist. A Caucasian species (*Astragalus falcatus*) has been recommended in France in preference to lucerne for cultivation on poor dry lands.

When the specimens from the Darling Downs were provisionally determined as *Astragalus hamosus* some of them were sent to Mr. Anderson, Curator of the National Herbarium of New South Wales, for confirmation and remarks. A reply was received to the effect that this species was already established in parts of New South Wales and was spreading slowly, but that it had not so far been considered as poisonous to stock. In connection with the possible poisonous properties of this plant, it should be noted that Pammel lists it as poisonous on the authority of Greshoff, but he does not mention anything concerning its poisonous action or properties. I understand that the Veterinary Adviser of this State is taking steps to test the species for poisonous properties.

The species is indigenous to the Mediterranean Region and Transcaucasia.

Astragalus hamosus.—Usually in this plant there are a large number of reclining and partly erect stems proceeding from a common rootstock. In our specimens there are more than ten of these stems. Each stem measures from 7-10 inches long. With the possible exception of the petals and some of the inner parts of the flowers, all of the parts of the plant above ground are clothed with white hairs which are pressed to the parts on which they occur. These hairs often impart a greyish look to the plant. The leaves consist of 8-12 pairs of leaflets and a terminal odd leaflet. Each leaflet has the appearance of a small leaf. The leaves are placed alternately on the stem. Each leaflet measures from ¼-½ inch long and is elongate egg-shaped in outline with the apex blunt and broader than the base. The flowers are small and yellowish white in colour; they are borne in groups at the end of stalks which are situated at the junction of the leaves with the stem. These flower stalks vary from about ¾ in to 2 inches in length. The pods follow the flowers. The pods are strongly curved or prominently sickle-shaped; they measure from 1 to 1½ inches in length and are about ⅛ inch in thickness. A peculiar feature of the pods is a partition running their whole length and dividing the internal part into two cavities. The

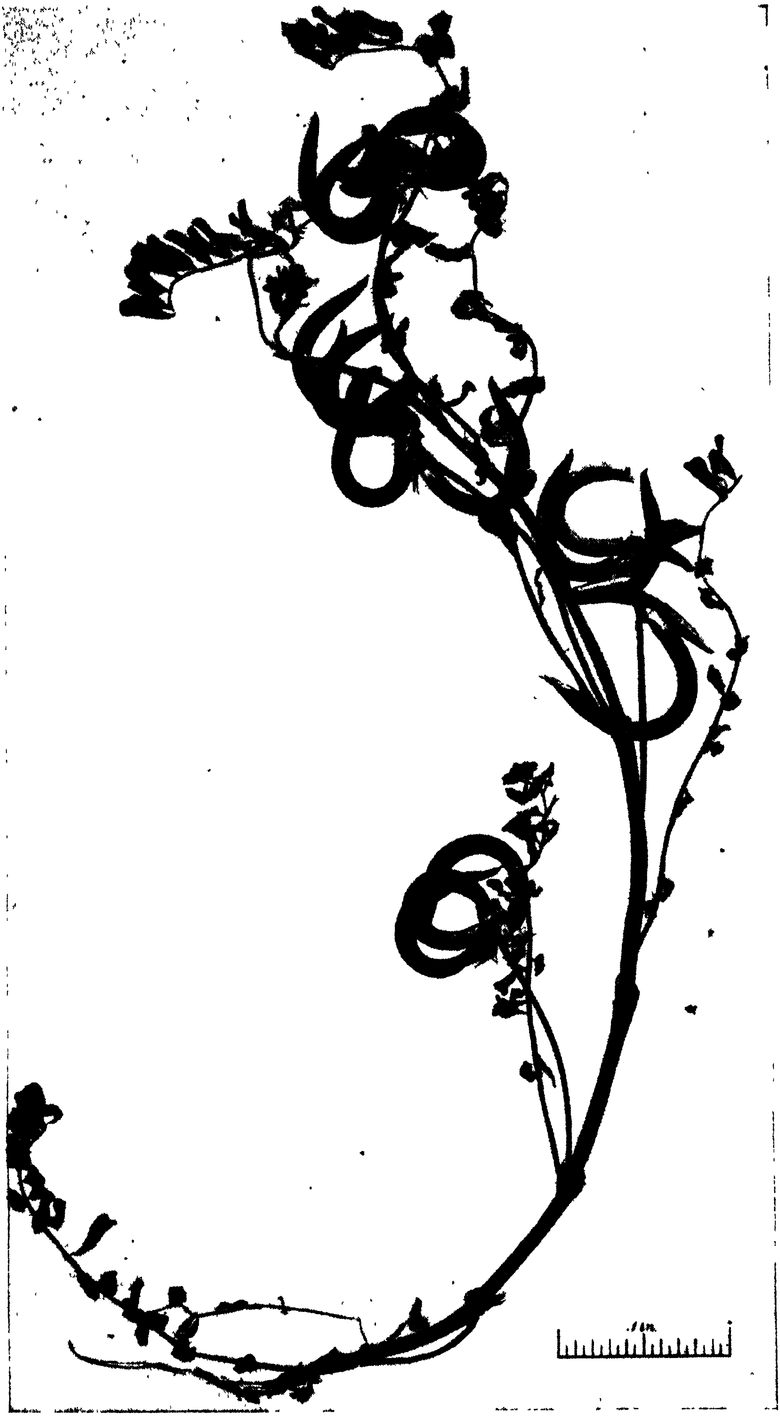

Plate 274.

A new weed on the Darling Downs, *Astragalus hamosus*. The inset scale measures one inch. Photograph from dried specimen.

[*Photo. Dept. Agriculture and Stock.*

seeds are contained in these two cavities. Each seed is smooth, peculiarly geometric (almost rhombic) in shape, and measures about $\frac{1}{10}$ inch in length.

The accompanying photograph (Plate 274) illustrates a dried specimen of the plant.

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Bentham and Hooker. Genera Plantarum, I, p. 506, 1862-1867.
Breakwell. Grasses and Fodder Plants of N.S.W., p. 357, 1923.
Pammel. Manual of Poisonous Plants, p. 829, 1911.

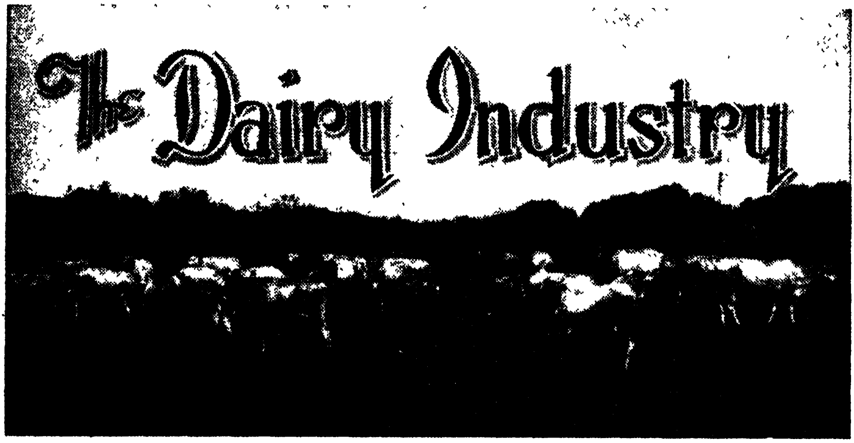
THE TAXPAYER AND THE PUBLIC SERVANT.

Many people think that the pay of every public official comes out of the purse of the taxpayer. Those people think wrongly. Many officials do not draw one penny of their pay from consolidated revenue, and are just as independent of that fund for their daily bread as are the outside taxpayers themselves. These officials, too, are not exempt from taxation which employees not in the service have to pay. Indeed, in many ways, Crown employees are much easier marks for taxation, and for the collection of taxes, than other employees. Various State Departments earn their own livelihood—some of them a good deal more; and the excess earnings go to help State activities—the education of the children of the taxpayer or the financing of loans for buildings and development. Demonstrating the contention, the State Insurance Office was established in 1916. In December, 1916, it employed forty-eight officers; its income for the year 1916-1917 was £202,569. As at 30th June, 1937, it employed 475 officers, its income for 1936-1937 was £1,406,743, and its total assets amounted to over £5,000,000. With the exception of the Workers' Compensation section, the State office, in a general way, is in open competition with public insurance companies, and has to fight and to fend for itself. It owns the well-known central building which is the hub of its operations. Thus, by keen and vigorous management and high efficiency, the State office has won for itself an honourable place in the world of insurance. It is apparent, too, that State Insurance supplied something which the public desired and has appreciated, otherwise the public would not have supported the office to the extent which it has done. And the staff and the general running expenses of this office are no more a charge upon the taxpayer than are the staff and the running expenses of, say, the A.M.P. Society. Comment on the same lines, but adapted to suit their special purposes, could be made of such self-supporting trust sections as the Public Curator's Office, State Advances Corporation (Workers' Dwellings), and the Agricultural Bank.

Employees paid from consolidated revenue numbered 27,979 at 30th June, 1937. Of these, 16,276 were engaged in providing railway service in return for fares and freights, and 750 were employed in sections which pay their way, such as the Titles Office, Machinery and Scaffolding Inspection, Government Printing Office. The remaining number of employees is 10,953, of whom 50 per cent. are in the teaching service and 25 per cent. are in the Department of Health and Home Affairs, which embraces police, prisons, asylums, and the general social services. The total annual cost of these two Departments alone exceeds the total income tax collections by nearly £500,000.

Seekers of truth may welcome these rays of light.

—J. D. Story, I.S.O., Public Service Commissioner, in his Annual Report to Parliament.



The Influence of Herd Testing.

L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

HERD testing is intended primarily to demonstrate to the dairy farmer the fat-producing capacity of each member of his herd. It also is of great benefit in improving the general standard of farm management. Experience has proved that better breeding requires better feeding, and an improvement in the quality of the dairy herds stimulates improvement in methods of pasture management.

New Zealand herd testing organisations have as an objective an average annual production of 300 lb. of butter fat per cow. In the Buller district of the Dominion, at least 40 per cent. of the cow population has been under test continuously since 1930. Since that year the following averages have been recorded:—

Year.	Fat per cow. Lb.
1930	230
1931	250
1932	279
1933	287
1934	297
1935	301

The Buller District Herd Testing Association has now fixed its objective at 350 lb. of fat per cow.

In the whole of New Zealand the average production per cow rose from only 127 lb. to 152 lb. between 1901 and 1919. The practice of herd testing then became more general, and in the shorter period 1920 to 1934 the average production rose from 152 to 220 lb. of fat.

In 1934, no fewer than 286,889 cows were tested for a period of 100 days or over, and their average production was 262 lb. of fat. The 1933-34 Queensland figures—29,521 cows, with an average production of 161 lb. of fat per cow—form a remarkable comparison.

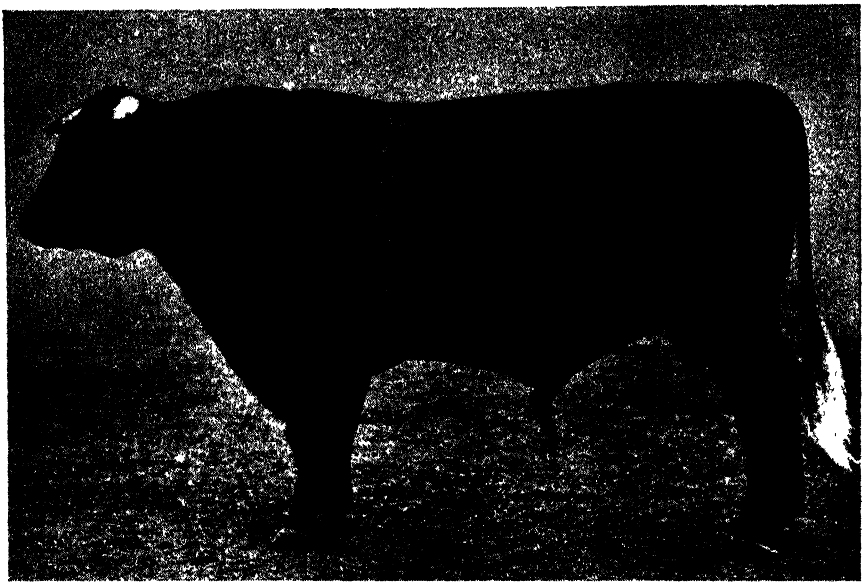


Plate 275.
BURRADALE BYRON, the 1937 Brisbane Show Champion Australian Illawarra Shorthorn bull; owned by J. Phillips.

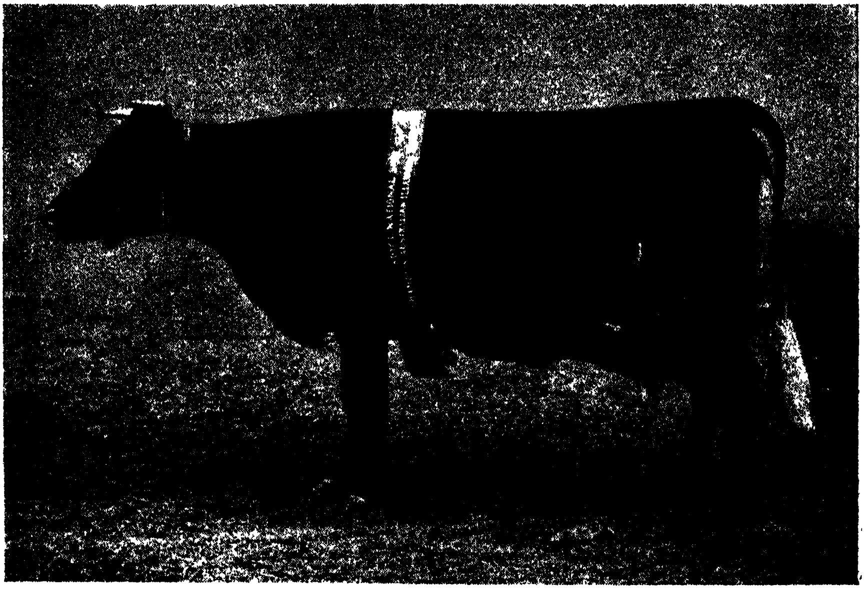


Plate 276.
MAY IV. OF OAKVILLE, the A.I.S. champion cow at the 1937 Brisbane Show; the property of G. M. Marquardt.

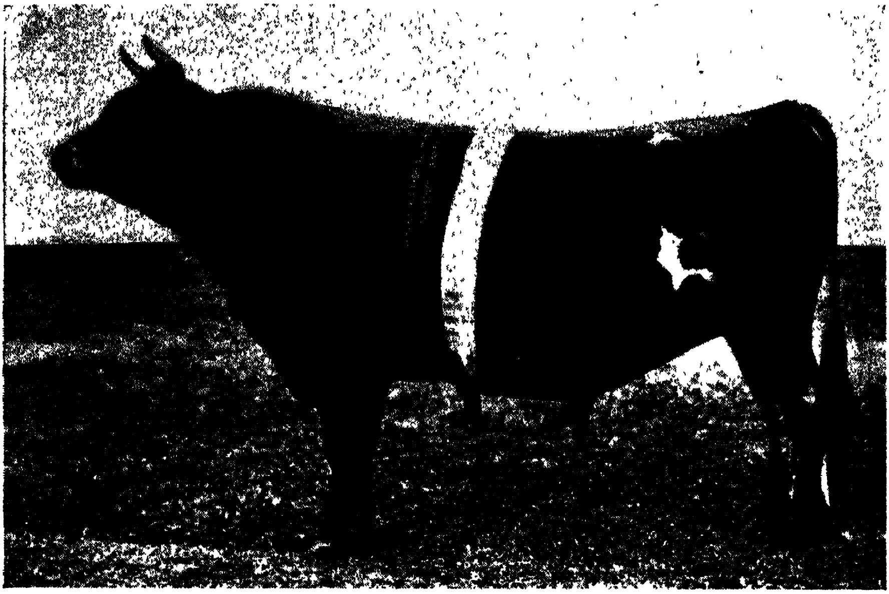


Plate 277.
OXFORD BROWN VICTORY, Champion Jersey bull at the last Brisbane Show, owned by Mrs. M. E. Stanton.

Plate 278.
OXFORD JOYFUL MAID, Champion Jersey cow at the last Brisbane Show; owned by E. Burton and Sons.

With the increase in production per cow came the problem of providing additional food. This was not done by bringing large areas of new land into production, but by improving pasture management. Close subdivision of paddocks, laying down of pastures of improved grasses, conservation of fodder, and the wise use of artificial fertilizers improved greatly the carrying capacity of the land. It has been stated authoritatively that the greater part of the 5,000,000 acres of dairying land in the Dominion is top dressed at least once in every three years. The Dairy Industry Commission's Report of 1934 shows that the liberal use of fertilizers goes regularly with an increased production and carrying capacity per acre, and a decreased overhead in the cost of fertilizer per lb. of fat.

Pounds of butterfat per acre.	Total fertilizer expenditure per acre. s. d.	Cows per per 100 acres.	Cost of fertilizer per 100 lb. of fat. s. d.
Under 75	5 8	29	9 11
125 to 150	10 9	52	7 10
200 to 225	14 8	71	7 0
Over 250	18 10	87	6 8

These figures were obtained by the New Zealand Department of Agriculture from a survey of over 500 farms in the North Island and, therefore, may be taken as typical.

Queensland herd testing figures for the last six years are:—

Year.	Number of cows tested.	Fat per cow. lb.
1932-2	10,383	165
1932-3	12,690	166
1933-4	29,521	161
1934-5	24,334	154
1935-6 (drought)	14,422	141
1936-7 (drought)	6,530	134

From information supplied by the Government Statistician the figures for the whole of the State are—

Year.	No. of Dairy cows.	Fat per cow. Lb.	Percentage of cows submitted to herd testing.
1931	775,301	127	1·3
1932	792,943	127	1·6
1933	877,709	127	3·4
1934	939,254	137	2·6
1935 (drought)	955,746	119	1·5

Some allowance should be made in respect of the average fat per cow taken from the Statistician's figures, as these include the production of herds which are milked only during the flush of the season and which should not be regarded as dairy herds.

Not only is the average production per cow very low, but the percentage of cows submitted to herd testing is most unsatisfactory. The average production is likely to remain low until dairy farmers take full advantage of herd testing facilities open to them, and apply more widely the principles of both herd improvement and pasture management.

Plate 279.
GOLF HILL CHEVALIER, Champion Hereford bull at the last Brisbane Show; exhibited by E. R. Reynolds.

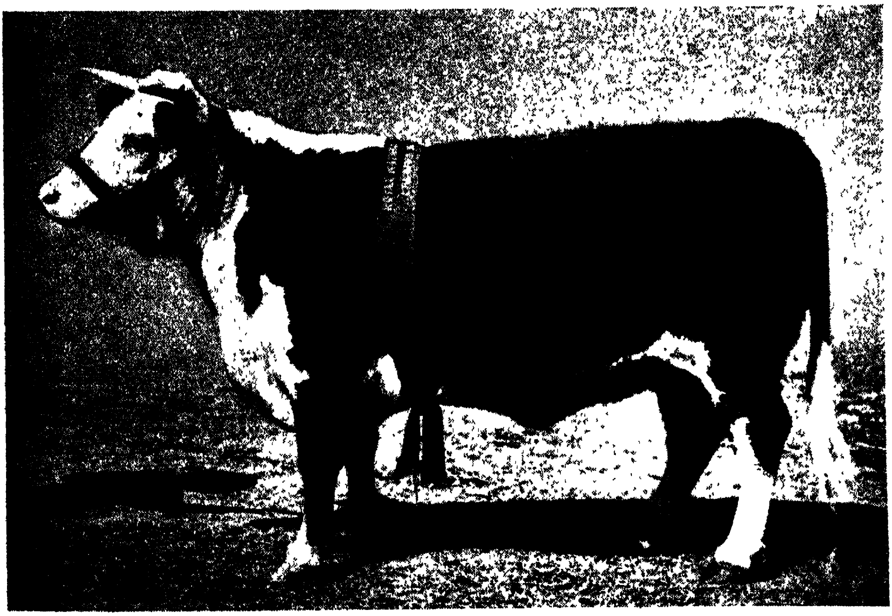


Plate 280.
COOTHARABA FANCY IV., Champion Hereford cow at the last Brisbane Show; the property of J. J. Galloway.

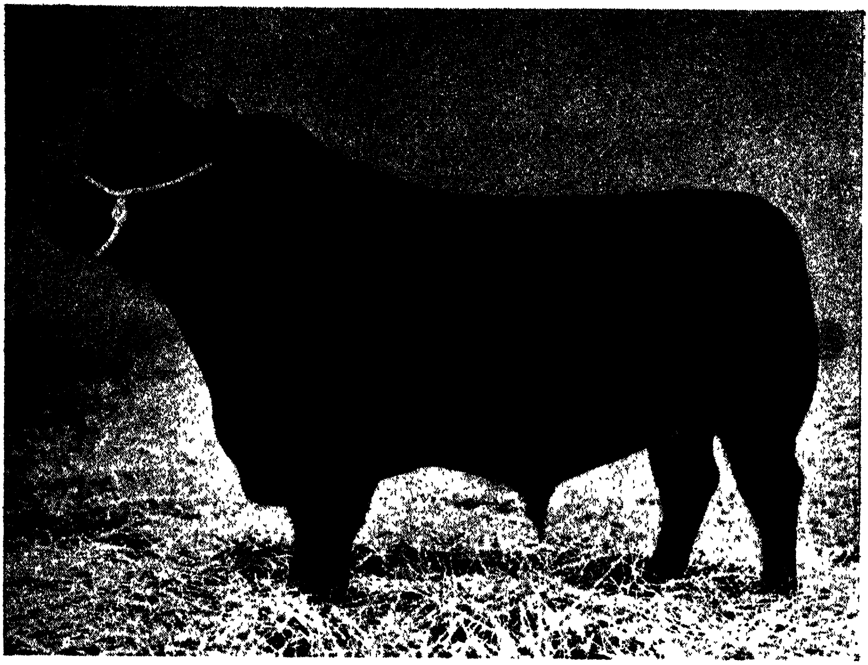


Plate 281.
BALD BLAIR WATT, the Aberdeen Angus bull that won the Champion Award in the last Brisbane Show; owned by F. J. White and Sons.

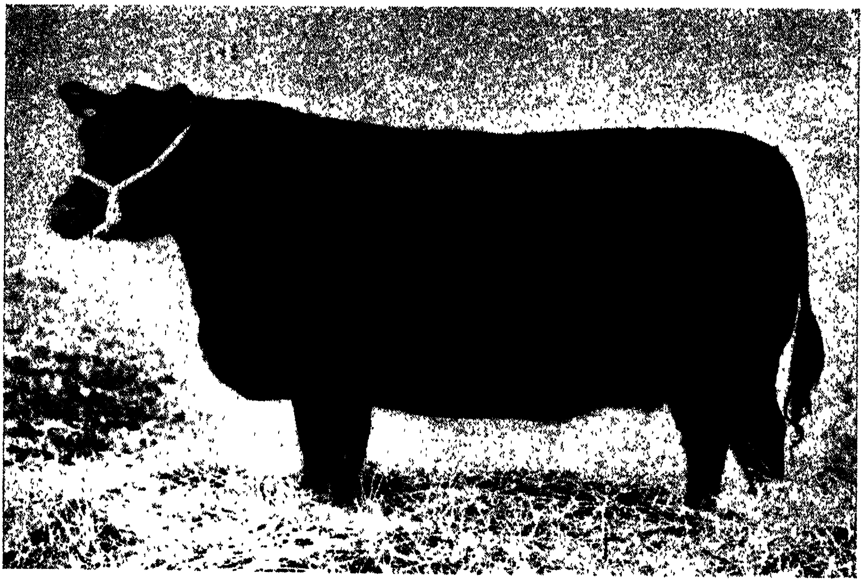


Plate 282.
BALD BLAIR NORA II., Champion Aberdeen Angus cow at the last Brisbane Show; the property of F. J. White and Sons.

Pneumonia in Swine.

JOHN LEGG, D.V.Sc., Government Veterinary Surgeon.

PNEUMONIA in young pigs is a very common disease in the dairying districts throughout the State. It appears to take on characters of contagious nature, and may spread very rapidly throughout a piggery. Once it is well established it may cause considerable losses, not only because a certain number of pigs are fatally affected, but because many of the recovered animals are left in such a state that they do not fatten and fail to reach maturity. Such pigs are commonly known as "runts" and are a distinct source of monetary loss to the farmer.

In America and Europe much work has been done in determining the exact cause of the various types of respiratory diseases in live stock. However, although the exciting causes have been discovered, it has been found that secondary factors have an influence on the development of these diseases. Little work of a similar nature has been carried out in Australia, but there seems to be little doubt that in this country, as well as in Europe and America, secondary factors are very important. These secondary factors can be summed up in unhygienic and dirty surroundings, herding of large numbers of pigs in relatively small areas, feeding numbers of pigs of various sizes and condition in common troughs, lack of sufficient exercise grounds and want of sufficient green stuff.

Generally speaking, the younger animals are much more seriously affected than the older and if the young pig contracts pneumonia in the course of the first few weeks of its life, the economic value of a litter may be reduced to negligible proportions.

It becomes necessary, therefore, to adopt all those precautions which mitigate against the spread of this disease, particularly among young stock. Isolation of the sow before farrowing and the maintainance of the litter under proper conditions during the first few weeks of life are very important. A reasonable degree of cleanliness is demanded; the avoidance of wet cold sties, proper exercise for the mother and a properly balanced ration all help to develop a vigorous and healthy constitution in the young pig. Isolation of the young animal cannot be carried on indefinitely, but, given a good start, the young animal is usually strong enough at weaning time to resist any possible infection which it may contract when the weaned pigs are brought together for fattening purposes on the farm.

Contagious pneumonia is not, as a rule, difficult to diagnose. The young pigs are unthrifty, do not eat well and show a tendency to isolate themselves from the others. There is usually a discharge from the eyes and nose, but one of the most prominent symptoms is coughing.

◆

FEEDING BACON PIGS.

E. J. SHELTON, Senior Instructor in Pig Raising.

Because of the conditions associated with the recent prolonged dry weather in Southern Queensland—from the effects of which the pig industry is still suffering—and of the fact that the price charged for pig foods of all descriptions is still very high, many pigs arriving at bacon factories are not in the primest of condition. When slaughtered their carcasses dress out soft, slightly discoloured, and, on grading, are classed as of other than the choicest grade; in fact, some are very fat and too heavy.

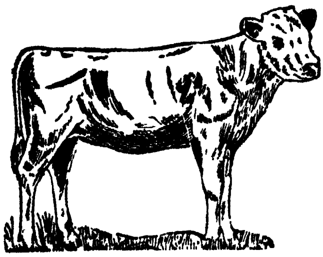
In some instances the fat is soft and oily, and in others it is of a slightly yellowish colour and will not "firm up" during the chilling process. If used for small goods, this soft, oily, discoloured meat still carries objectionable features. The loss to the industry through this trouble, plus the lower condition of many of the pigs that kill out to advantage, must be very heavy, for it is impossible to expect factories to pay top prices for second or third grade carcasses.

The Department of Agriculture and Stock, therefore, offers the following advice to farmers, especially in districts south of Rockhampton:—

Soft, Oily Pork.—Although several foods may be responsible for this soft condition, all the evidence points to the fact that the chief cause of the trouble is the feeding of peanuts or meal manufactured from peanuts to pigs which are being finished or topped up for the market. Maize and other grain foods are relatively scarce and high priced, and as peanuts produce particularly fast growth in pigs, farmers are naturally tempted to use them or the meal in place of grain. The position could be relieved if pig raisers would concentrate their peanut feeding on the breeding stock and young store pigs, which will make very good use of surplus peanuts, and then other foods available could be kept for the pigs from the store stage until they reach bacon weights. Separated milk, root crops, pumpkins, lucerne (either as green fodder, hay, or chaff), and small quantities of pollard, meat meal, and pasture can be used to make up good rations in the absence of maize.

Yellowish-coloured Pork.—It is known that the probable cause of this condition is an excess of carotin, a colouring matter in plant life, and which is present especially during the early life of the plant and at the stage when (as in the case of pumpkins) the crop is fully ripe or

• AGGRESSIN •



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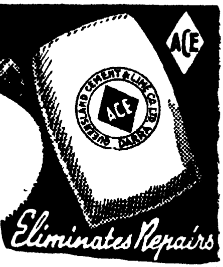

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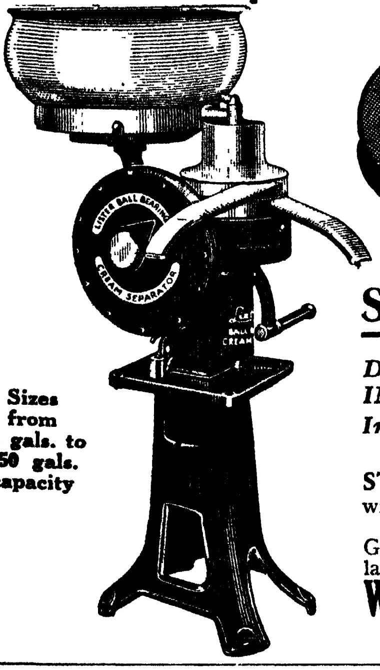
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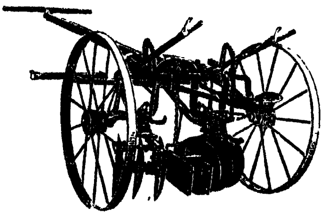

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over-ripe. The feeding of an excess of green wheat, oats, or barley, in the absence of, or short supply of milk may also be responsible; so also may the continuous use of grass or of lucerne as the principal food.

Low-conditioned Pigs.—Lack of condition is, of course, invariably due to lack of sufficient nutritious food. When pigs are in such a condition they become more liable to infestation by internal and external parasites, which irritate the animal and cause much restlessness, especially at night.

It is better to keep fewer animals and to feed them properly than to attempt the keeping of more than the number for which food is available. It is better, too, to market the pigs when light and prime than to carry them on to heavier weights with loss of condition. Where milk is in short supply, meat meal may be used as as substitute. In all cases, the pigs should have clean drinking water and mineral material like charcoal.

Bruised and Damaged Pigs.—Where pigs are weakened as a result of lack of condition and where they are soft in texture—the result of improper food—they bruise much more readily, and tend to be more discontented. The only way to avoid bruising is to have the animals in the primest condition (not over-fat) and to treat them kindly and not force or beat them when when loading or unloading. Avoid kicking them or forcing them through narrow gateways or over rough stony yards.

Over-fat Pigs.—Despite high-priced foods, there is still a proportion of over-fat and very heavy weight stock coming forward. Pigs should not be fed too heavily on grain, but should be kept growing and given abundant exercise in grassy pastures. It is a mistake to keep pigs penned up continuously in small sties and bare yards. The use of flesh-forming foods like milk, meat meal, lucerne, greenstuffs, &c., and mineral matters will tend to overcome any tendency to over-fatness.

◆

HINTS ON PIG-FEEDING.

Grain feeding enters largely into successful pig raising, so that the form in which it is fed is important. Pigs which have been fully fed with corn through their growing period usually make good use of the whole grain, and corn in cob feeding may be adopted. Animals that are fed with corn only occasionally may not masticate it thoroughly, and a waste is incurred. For these a preliminary cracking is advisable.

Well-ground grain is fed usually only to stud animals or stock for exhibition.

The appearance of whole grain in the dung may encourage pigs to eat excreta. This is a clear-cut case for grinding.

Milling by-products are usually fine, and this may be a disadvantage when the pens are in an exposed position or during windy weather. The waste may be reduced considerably by wetting.

There is no need to prepare pumpkins or squashes, beyond the breaking of hard-skinned varieties, e.g., ironbark pumpkins.

Most tubers may be fed as harvested, or the pigs can be allowed to harvest for themselves. It is advisable to cook potato "culls."

Milk, milk products, seed cake preparations, meat and blood meals, and cereal by-products require no preliminary treatment whatever.

Lucerne or other roughages are well masticated usually by older pigs, and young pigs eat such small quantities that there is no point in chaffing.

LOSSES AMONG YOUNG PIGS.

Of all the losses with which the pig raiser has to contend, none involves such heavy financial loss as that associated with mortality in young pigs prior to the stage, and age, at which they are ready for marketing. Probably 25 per cent. of the average litter of pigs is lost before the weaning age (eight weeks), and from 20 to 25 per cent. of the remaining pigs fail to reach the market at an age at which they would return the maximum profit.

Careful investigations made in New Zealand showed that the commonest cause of loss before weaning is lack of attention at the time of farrowing, a number of pigs being suffocated at birth or killed by the sow. It was found that premature birth had caused considerable losses, while the number of still-born pigs either perfectly or incompletely developed was also considerable.

Most of these losses were considered to be due indirectly to defective feeding of the brood sow and to mineral deficiencies in the diet.

It must be remembered that pregnant sows may be underfed and improperly prepared for farrowing in several ways. Lack of succulent green food, drinking water, mineral matter, readily digestible food, and also want of exercise, are frequent causes of trouble at farrowing time. New Zealand experience was that, far from causing harm, a liberal feeding of the brood sow resulted in the production of heavier and better pigs at birth, provided, of course, the sow was active and healthy.

The remedy on many farms lies in providing necessary supplements to the food supply—such as meat meal, root crops, and plenty of milk, with the addition of mineral matter.

Strict limitation of the food supply a day or two before farrowing is necessary. Careful feeding, a clean, dry, nicely bedded pen with suitable farrowing guards, and quiet surroundings in which the sow can settle down to farrowing are very important.

Losses after weaning also are unusually heavy where improper management exists. In New Zealand it was estimated that approximately 125,000 pigs, which should be available for slaughter as porkers or baconers, die every year before reaching that stage. The period dating from the eighth to the twelfth week after birth is one of the most susceptible in the life of a pig. The system adopted should aim at feeding the young pig in such a way that there will be no check in growth prior to, at the time of, or after weaning. Care should always be exercised to minimise the shock of the change over from the sow's milk to other foods by providing, for instance, a separate pen in which the young pigs can feed apart from the sow.

The greatest check in growth results from the young pigs having to contend with older pigs at the feeding trough. Additional hindrances are overcrowding, filth, dampness, parasite infestation, and lack of clean drinking water.

—*E. J. Shelton, Senior Instructor in Pig Raising.*

◆

A PROFITABLE SOW.

Mr. Dave Johnston, of Malanda, North Queensland, in reporting the loss of his well known large white sow "Hillcrest Rosebud," winner of many champion prizes at Tableland and Cairns shows, advises that this sow was mated on each occasion to the large white boar "Commonwealth Candidate." Her records are as follows:—

HILLCREST ROSEBUD. Registered No. 2787.

Date of Birth of Litter.	No. of Pigs in Litter.
19th December, 1932	17
18th July, 1933	18
27th January, 1934	20
12th August, 1934	19
9th January, 1935	18
27th September, 1935	17
23rd February, 1936	12
1st October, 1936	19
4th April, 1937	15
4th October, 1937	18

To have produced that number in ten litters is a meritorious performance and again demonstrates the productiveness of the modern brood sow.

Ophthalmia of Domestic Animals.

ROSS NOTT, B.V.Sc., Government Veterinary Surgeon.

THE disease known as ophthalmia, which is an inflammation of the eye, and often is referred to as "blight" or "pink eye," affects all the domestic animals, although it probably is encountered most frequently in cattle and sheep.

The disease is contagious and is brought about by the entrance of a special germ into the eyes. Injury to the eyes such as is caused by grass seed is considered sometimes to be the sole cause of blight. This, however, is incorrect, for the true contagious form of the disease cannot be produced unless the specific germ is present. It must not be overlooked, however, that any foreign material which becomes lodged in the eyes will set up irritation and give rise to a non-contagious form of ophthalmia, and, secondly, eyes in such a condition are more susceptible to the contagious form.

The infective material which is responsible for setting up new cases is present in the discharges from the affected eyes, and frequently it is carried from one animal to another by flies. Another method of spread, particularly with sheep, is by long grass, &c., becoming contaminated with eye discharges, which are transferred later to the eyes of healthy animals grazing over the same area.

The first charge noticed following infection is a watery discharge issuing from the inner corners of affected eyes. If the eyes are examined at this stage, evidence of inflammation will be seen in the form of a general reddening and enlargement of the minute blood vessels. As the disease progresses the discharge becomes more copious and full of pus, and the eye generally becomes dull. If no treatment is given, a film appears over the eye and the animal becomes temporarily or in some cases permanently blind. The film is due to an inflammation of the surface layer of cells. Frequently the case does not extend beyond this stage, and even without treatment the eyes begin to recover gradually and rturn to normal. In other cases the inflammation may extend to the deeper structures, leading to permanent blindness in one or both eyes. In those cases which recover without treatment the animals may be blind partially or totally for up to a week, and during this period they are difficult to drive and usually lose condition. Losses are also experienced through the animals becoming separated from the rest of the herd and not being able to find water.

If animals are treated in an early stage of the disease they recover quickly. Several mixtures may be used in the form of drops into the eyes, and very good results have been obtained with a 2 per cent. solution of zinc sulphate. To make this solution ¼ oz. of zinc sulphate is dissolved in 1 pint of clean water, which has been boiled and allowed to cool. A 5-10 per cent. solution of argyrol also is effective. For treatment, about ten drops of one of the mixtures mentioned are dropped into each affected eye at least once, and, when possible, twice or more daily. The treatment should be continued until the eyes have returned to normal.

In the case of valuable animals the discharge should be cleaned away from the eyes with a boracic acid solution, and yellow oxide of mercury ointment (1-50) should be applied to the lids to prevent them from sticking.

As the disease is contagious and rapidly spreads from animal to animal, the affected cases, particularly when only few in number, should be isolated until they have recovered completely. Particular care should be taken when new animals are introduced to see that they are not infected, as the disease often is introduced into and spread through a flock by such means.

In the case of sheep it is wise, when facilities are available, to treat all the animals and to draft off those showing evidence of the disease for more intensive treatment in a small hospital paddock.

WOUNDS IN HORSES—SIMPLE TREATMENT.

The fundamental principle underlying all wound treatment is the provision of suitable downward drainage for the discharge from the wound. If such drainage is provided then most wounds tend to heal well, but deep wounds penetrating downwards and which form pockets do not progress satisfactorily, for the reason that pus and discharges collect within them and cannot get away. Wounds which penetrate in an upward direction need little treatment beyond ensuring that they remain open while healing from their deepest part and that they are reasonably clean on the surface. In the case, however, of downward penetrating wounds it is necessary to use a knife judiciously in order to allow the discharge a free outflow.

Before any wound treatment is attempted, the injured edges of the wound should be clipped with scissors to remove the hair and reveal the true nature of the wound. The next thing to do is to wash the wound thoroughly with a warm, weak disinfectant solution Then, if necessary, the depth of the wound can be explored with a blunt probe which has been boiled, or with the fingers after the hands have been thoroughly washed and scrubbed. Punctured wounds—such as nail or stake wounds- are always difficult to drain and often have to be opened up. Microbes are carried in when the foot is punctured, pus of a black liquid and foul smelling nature may gather in the foot, and may continue to accumulate because it cannot drain away. If that happens, acute lameness is certain to follow. If unattended, these corrupt fluids rise slowly above the level of the horn and eventually break out through the soft skin over the coronet; but by that time the structures within the foot are in a nasty mess and the case has become very serious.

To treat hoof punctures, the whole foot is cleaned and, if possible, it is held in a bucket of warm disinfectant solution to still further cleanse it and also soften the horn. The sole of the foot is then pared away by making a cone-shaped hole at the point where pain is most acute. The apex of the cone must be carried right through the horn until blood or pus is revealed. The pus should then be allowed to drain away. To prevent the hole from closing, a pad soaked in a solution of iron perchloride should be placed in the wound and the treatment should be repeated daily while necessary. If treated thoroughly in the way described little further attention is necessary.

CARELESS BRANDING.

Slovenly methods in the branding of stock, particularly cattle, are in evidence far too frequently, the results being most undesirable in many respects. Quite often the carelessness with which the branding irons are applied involves cruelty, although it may be unintentional.

It is cruel to hold the hot iron on an animal until the skin is burnt through, and it cannot be justified on the score of necessity. This practice may be due to underheated irons, but, on the other hand, it may be due to over-hot irons held on the skin a fraction of a second too long, or with too much pressure. Such branding causes blotches, and very often the actual letters or figures are undecipherable. The skin in the area involved is ruined for tanning purposes, and festering sores may result. Identification of the animal by means of such a brand is rendered very difficult, if not impossible.

It is a well known fact that, on large stations, where thousands of calves are branded yearly, and where speed is a factor in the handling of large mobs, the standard of branding is much higher than on some small holdings—such as farms, where only two or three calves may be branded at irregular periods.

Castration of Colts.

W. DIXON, Inspector of Stock.

THE best time of the year to perform this important operation is the spring, when rain has fallen and green feed is available, and before the hot weather has set in.

The colts to be gelded having been yarded over night, it is desirable, before proceeding with the operation, to take precautions against losses through infection of wounds. Crude carbolic acid or phenol in a solution of 7 oz. to 1 gallon is a suitable disinfectant, and should be sprayed over the ground and rails of the yard.

All instruments used should be sterilized by boiling for at least ten minutes, and should be wrapped in a sterile towel and kept in a box at the yard until required.

After each colt is done the instruments and hands of the operator should be washed in a weak solution of carbolic acid, this solution being kept in a separate vessel, and only sufficient for each disinfection being poured into a dish for the purpose, and then thrown away. The practice of using a petrol or kerosene tin filled with disinfectant to wash instruments and hands time after time is risky.

For unbroken colts, the rough and ready methods of röping, choking, and throwing as practised on many stations may cause the loss of valuable animals. These losses may be minimised if a crush with side gates is available, so that the colt can be haltered and side lines used on him before the gate is opened to cast him.

The colt, having been cast on his left side, the hind legs drawn up to the shoulders and made fast with half hitches, the fore legs can now be secured with the knees bent to the hind feet.

The scrotum, sheath, and penis should be washed with warm water and soap, care being taken to remove any suety deposit from the penis and the cavity at the end of the penis. The left or lower testicle (the colt being on his left side) is seized in the left hand, and pressed until the skin is tight over it; a bold incision from front to back, parallel with the median line is now made, penetrating the outer skin and the tunica, laying the testicle bare. As the incision is made, the cord should be grasped firmly in the left hand to prevent the retraction of the testicle upwards through the canal. When this happens it is sometimes difficult to recover, and the subsequent manipulation in an attempt to bring it down delays the operation, and causes unnecessary shock to the patient. The knife is now slipped between the anterior and posterior portions of the cord, and the latter (posterior), which the muscle retracts, is cut completely through.

The testicle now lies inert, connected by the anterior portion of the cord, whih is composed of blood vessels, and should be drawn out until it is taut, without using force, when the emasculator (if that method is being used) should be used close to the belly, with a slow squeezing movement, taking care that the crushing part is nearest to the belly, and the cutting part to the testicle. The cord should be severed as short as possible, so that it may not hang below the wound, and so cause complications.

The other testicle may now be removed in a similar way.

It is advisable to swab the wound with a solution--1 to 2,000—of chloride of mercury. The ropes may now be removed, and the colt allowed to rise and walk out of the yard, so as to be away from dust.

If the operation has been performed carefully, and all antiseptic precautions taken, recovery should be rapid and no further treatment is necessary, but if undue swelling is noted, the wound should be opened with the fingers, after washing the hands with carbolic solution, so that there may be free drainage, and the wound swabbed with disinfectant.

Some bleeding always occurs, but rarely lasts for more than half an hour, but if copious bleeding persists after that time—as is the case when emasculators have been used carelessly—the cord must be found, and the artery tied with silk thread. If the stump of the cord cannot be found, the canal should be plugged with pledgets of tow or wool soaked in muriate of iron of the same strength as obtained from the chemist, which helps to form clots, and so closes the artery.

◆

LAND FOR GRAZING HOMESTEAD SELECTION.

A resumption from Evesham holding has been surveyed as portions 5, parish of Montford, and 3, parish of Worcester, and will be open for grazing homestead selection at the Land Office, Longreach, on Tuesday. 18th January, 1938.

The portions are situated 3 miles westerly and 20 miles south-westerly, respectively, from Morella railway station on the Longreach-Winton railway.

The areas of the portions are 19,557 acres and 29,380 acres.

Each selection will be for a term of twenty-eight years and the annual rent for the first period of seven years is 2¾d. per acre.

Each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep during the first three years.

The portions are watered by sub-artesian bores and tanks. They comprise open pebbly and brown soil downs, lightly to moderately shaded, well grassed with Mitchell and Flinders grasses, and are good wool-growing and fattening country.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Longreach, and the Queensland Government Tourist Bureaux, at Sydney and Melbourne.

◆

NEATSFOOT OIL KEEPS HARNESS IN GOOD ORDER.

For keeping harness in good order, neatsfool oil needs no recommendation to farmers.

Neatsfoot oil is made by boiling in a suitable receptacle the feet and leg bones (up to the knees) of well-grown cattle. The material should first be thoroughly cleaned by scalding and scraping it free from hair, dirt, &c.; it should then be covered with water, which should be brought to the boil and then allowed to simmer for about two hours. After the oil has risen to the surface it should be skimmed off and the mixture boiled again, and a second skimming made.

The oil thus secured should be strained through a piece of cheese cloth, in order to remove pieces of flesh, &c., from the mixture, and the strained product should then be boiled again, great care being taken that it does not catch fire. Finally, it should be strained again, cooled, and bottled. Pure neatsfoot oil should be light lemon in colour.

The method described is for manufacture on a small scale. Manufacture for trade purposes necessitates the use of a much more detailed and tedious process.

Breeding Fowls for Egg Production.

J. J. McLACHLAN, Poultry Inspector.

IN breeding poultry the farmer should exercise the utmost care in order to establish and maintain a high-quality flock. The progress made in the past has been considerable. Egg production has been increased from about 60 eggs to over 200 eggs per bird per annum, many individual pullets laying over 300 eggs in a year.

In dealing with egg-production in a flock of birds consisting of an equal number of pullets and hens, many authorities quote 12 dozen as a fair average annual production. It is doubtful, however, whether there are many poultry farmers in Queensland who obtain an average production per bird of less than 13 dozen eggs yearly. In some experiments conducted at the Animal Health Station, using White Leghorns purchased from a poultry farmer as day-old chickens, the average production over the two years was 181 eggs per bird, the variations being—pullet year, from 194 to 209 eggs; second year, from 155 to 162 eggs. There were 116 pullets used in this experiment and it will be noticed that the average of the two years was over 15 dozen eggs, and even these birds in their second year laid over 13 dozen. These birds were kept under poultry farm conditions.

The poultry farmer should be able to obtain an average production at least equal to those figures. A constant high average production is only obtainable by good breeding in conjunction with good management and feeding.

The chief considerations in arriving at the standards of good breeding are:—Type, constitutional vigour, action, and laying characteristics. Having selected birds that are reasonably true to type, care must be taken to see that they are of strong constitutional vigour. This is indicated by the vitality, stamina, health, brightness, and alertness of the bird, and is of equal importance to the knowledge of the actual number of eggs laid. As an example, some years ago the first three birds in a laying test laid 302, 296, and 294 eggs respectively. An examination of these birds at the conclusion of the test showed that the first and second birds were weak in constitution, whereas the third bird was very strong. All these birds were used as breeders, but while the progeny of the first and second hens were disappointing layers, the descendants of the third bird have performed very well in laying tests every year since. That example should emphasise very clearly the necessity for rejecting birds that are weak constitutionally.

Admittedly it takes courage not to breed from a 300-egg bird. If such a bird produced the eggs without a heavy drain on her body she would be constitutionally strong. If, however, the bird rapidly loses condition during the year, she is obviously weak in constitution and consequently would probably be an indifferent breeder. Any bird that is unable to stand up to a heavy season's laying without losing condition cannot be expected to give high-laying progeny and should be discarded irrespective of other characteristics.

Points for Poultry Breeders.

J. J. McLACHLAN, Poultry Inspector.

THE poultry farmer, in selecting birds for breeding purposes, should reject any bird which does not measure up satisfactorily in constitutional vigour, irrespective of other considerations.

A strong bird has adequate size, is well-fleshed, with prominent eye, full face, a sprightly carriage, and is very alert and active.

Although there actually is no egg-laying type of bird, there are some very definite laying characteristics which are valuable in the selection of birds for either breeding or production. For instance, capacity is essential to permit of the necessary expansion in the reproductive organs of a hen. The ovary develops from about the size of a two-shilling piece to approximately the full circumference of a teacup, and the oviduct from about 9 inches long and ½ inch wide to about 18 inches long and 1¼ inches in width. In addition to this it may be mentioned that a laying fowl consumes more food than a non-layer: thus the intestines would contain more food. A bird should have a long, deep, wide body, or, in other words, capacity.

The head is another valuable guide, particularly in respect to health. The face should be full, red in colour, and fairly free from feathers. Sallow or sunken-faced birds should be avoided. The eye should be full, round, bright, prominent, and expressive.

Strict attention should be paid to the colour of the eyes, particularly with breeds that should have red eyes, as there is a tendency for such breeds to have greenish-coloured eyes. Birds with green or light-coloured eyes are prone to become short-sighted and even go blind early in life. The skull should be strong but fine, and birds with overhanging eyebrows should be avoided.

The plumage of the birds, as it walks around the pen, should be examined, and careful notice taken as to whether the plumage fits close to the body or is loose and fluffy. As the tight or close-feathered bird usually is a better layer than the loose-feathered bird, it is only natural that only the former should be bred from. To the inexperienced person the contrast in feathering is more easily noticed in heavy breeds such as Australorps than in White Leghorns.

The thickness of the shanks is a good guide with respect to the coarseness or fineness of the bone. A coarse-shanked bird is a coarse-boned bird, and generally a poor layer. A layer-breeder has fine shanks, and the undersized bird, as a general rule, has over-refined or spindly shanks.

Any bird which is a known layer of small eggs should be passed over. As far as is possible only birds which lay eggs slightly above 2 oz. in weight should find their way into a breeding-pen.

Special care must be given to the selection of the male bird. All the features mentioned regarding type of females apply also to males. An active, alert bird should be selected, as such males will give better fertility and stronger chickens than will dull, slow birds. Young males can be mated with more females than older birds. Twenty females can be mated with a White Leghorn cockerel and sixteen females with an Australorp cockerel, if in each instance a vigorous male is used.

Male birds, the sons of known producers of large eggs, are most valuable, as the characteristic of production is transmitted from the hen, through her son, to her granddaughters.

Should pullets be used as breeders? is a question that is frequently asked. The answer to that is that if they are fully matured and up to standard in respect to type and size, and produce eggs of the recognised weight of 2 oz., they should be equal to older birds as breeders. Why object to breeding from pullets and at the same time use cockerels for mating purposes? It must be admitted, however, that where records are kept of egg production, breeding from hens which are heavy layers has proved more profitable than breeding from pullets, which more or less are an unknown quantity.

Plate 283.

[*Photo. P.E.I. Branch.*

On the Road to Kirrama State Forest, North Queensland.—This new road gives access to hitherto untapped timber lands in which Kauri pine and other cabinet woods abound. It is one of the several large forestry road projects in progress in the Far North, the work of the Public Estate Improvement Branch of the Lands Department.

Agricultural Notes

Summer Cultivation.

DURING early summer the soil should be kept free of weeds and the surface loose. For this purpose it is a very common practice to make frequent use of cultivators.

The cultivator certainly covers the area rapidly and is useful in quickly checking evaporation by breaking up a crust formed after rain, but there are objections to its too frequent use. The surface soil becomes too fine, which prevents subsequent rain from freely percolating through it, and thus much of the moisture flows away or is evaporated instead of soaking in, and if much flowing occurs surface soil is also carried away. The fine soil also becomes easily caked even by small falls of rain, and the mulch is, therefore, easily destroyed, and in showery weather requires very frequent renewal. Constant use of the cultivator also forms a sole pan; thus as the season progresses the mulch becomes more shallow and, consequently, less lasting, while the sole pan also prevents free percolation of rain or artificially applied water, which means further loss by evaporation or actual flowing away.

The plough, on the other hand, leaves the surface in a condition which allows the rain to percolate more freely and forms a more lasting mulch, as it is not so easily destroyed by light rains; the plough, moreover, is more efficacious for keeping down weed growth. Weeds are not harmful until their roots have extended through the mulch and are drawing on the moisture below, but if one is depending on the cultivator to keep them down they must be dealt with while they are far smaller than if one uses a plough.

Summarised, the arguments for greater use of the plough for summer cultivation are that a more enduring mulch is obtained, weeds do not require such frequent attention, water is enabled to percolate more readily, and loss of surface soil is reduced. It is only fair to state that heavy rains, which will destroy the mulch, may occur soon after the use of the plough, and in such cases the advantage of the more lasting mulch is lost; however, this does not always occur, and the other disadvantages remain. The cultivator should be looked upon as a quick substitute, and should be used chiefly when it is desired to check immediate evaporation, and the work should be more thoroughly carried out with the plough later as time permits.

One objection to the use of the plough for summer cultivation is that it upsets the levels of the land. This is of greater importance where irrigation is practised. The drawback can be minimised, if not wholly overcome, by using a plough with the mouldboards removed.

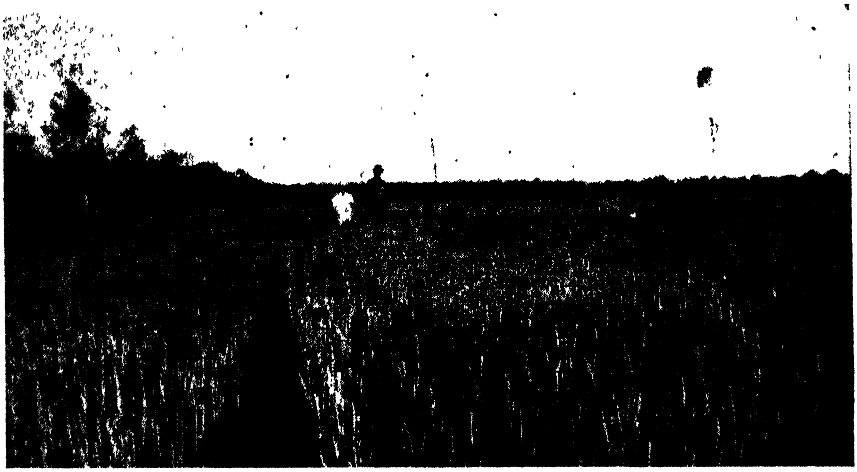

Plate 284.
A Wheat Crop at Columboola.

It is sometimes argued that it is risky to use a plough among deciduous fruit trees during their active period on account of injury to the roots. Undoubtedly, by the careless use of the plough damage can be done, but though it may not be so discernible, careless use of the cultivator can also cause root injury. Moreover, because the plough maintains a deeper mulch throughout the season, as already mentioned, the trees are prevented from forming roots too close to the surface. The greatest risk of serious root injury occurs when the later winter ploughing is delayed until the trees are active in the spring—feeding roots are disturbed just when there is heavy demand on the trees by blossoming and fruit setting.

◆

FERTILIZER FOR STANDOVER CANE.

It is well recognised that a two-year-old crop of cane possesses the virtues of an early-maturer, in that it possesses a high sugar content early in the harvesting season. Indeed, it is often found that such a crop tends to over-maturity as early in the harvesting season as August, and any grower who has much of this class of cane to harvest is advised to take steps to offset the disadvantage of having too much mature cane early in the season.

A very simple means is at the disposal of the grower, and the following method is recommended to all farmers with stand-over cane. It has been proved that sulphate of ammonia both improves cane yields and delays maturity. Therefore, an application of even one bag of sulphate of ammonia per acre, applied in the spring, to one-year-old cane, will assure a vigorous second-year growth and delay the maturity of the crop sufficiently to enable it to be harvested when just mature. Cane at the peak of maturity always gives the best returns to the farmer.

—H.W.K.

Save P.O.J. 2878!

THIS appeal is directed to cane farmers in Southern Queensland, particularly in the Moreton area, where the variety P.O.J. 2878 is giving such remarkably good results, especially as a standover cane. P.O.J. 2878 was introduced into Queensland in 1928 during the search for suitable gumming disease resistant varieties. Experimental tests soon established the fact that it possessed very high resistance to gumming and mosaic diseases, the then chief diseases of the South. Farm trials followed and these demonstrated the great value of this cane as a farm cropper. Its vigorous growth, resistance to drought and wet conditions, strong ratooning, and the gumming resistance which enabled it to be stood over to make rapid second year growth, all combined to recommend it to the farmer. From the farmer's point of view the variety has, in fact, only one really serious drawback in Southern Queensland and that is its susceptibility to Fiji disease. P.O.J. 2878 contains ¼ "wild blood"; it is this wild blood which confers the resistance to gumming and mosaic diseases but, unfortunately, at the same time confers susceptibility to Fiji disease.

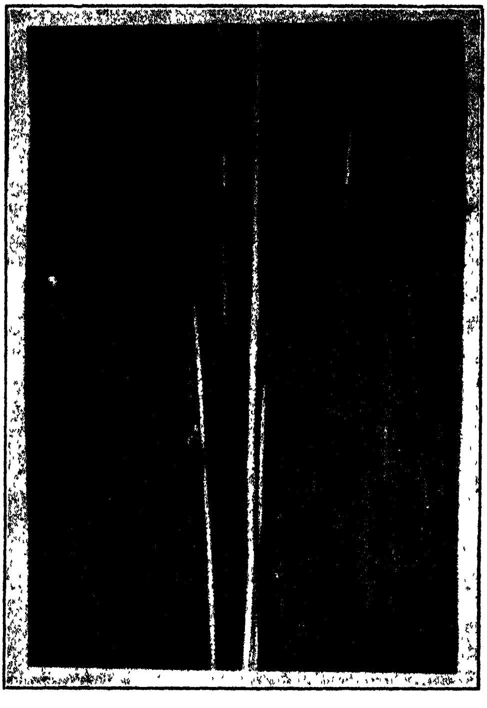

Plate 285.

Illustrating the small gall-like swellings of the veins which occur on the under surface of leaves of plants affected with Fiji disease. One long gall may be seen in the centre, running the whole length of the photograph; the smaller galls scattered over the leaf are of the size most usually seen. This leaf is reproduced at natural size.

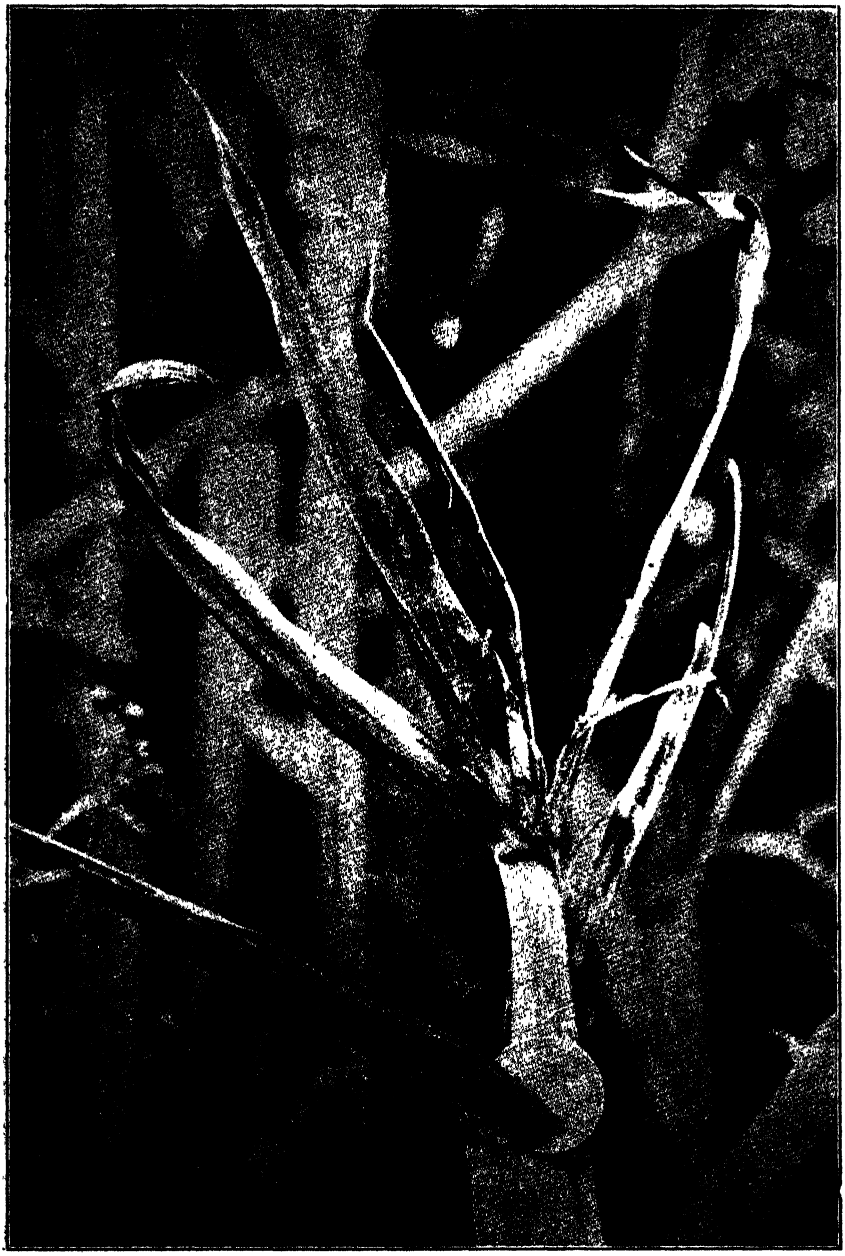

Plate 286.

An advanced stage of Fiji disease attack on a growing stalk of cane. The leaves have become stiff, stunted, and misshapen, and the top looks as though it had been chewed by some animal; such leaves bear on their under surfaces galls of the type pictured on page 714. At this stage all further growth has ceased and the stalk dies before long.

Fiji disease is common in parts of the Maryborough area and P.O.J. 2878 is a disapproved variety there in consequence. The disease is not very prominent as yet in the Bundaberg-Isis, Bauple and Moreton districts, but it has spread in the past few years and constitutes a continuous menace to the successful cropping of P.O.J. 2878, especially on irrigated and river flat lands. It is true that up to the present the damage in the Bundaberg-Isis, Bauple, and Moreton areas has been almost negligible; obviously, *now* is the time to take precautions. Even if unchecked spread were allowed to take place the total damage in two-three years' time might still be comparatively light *but by then it will have become difficult to obtain reliable disease free plants and trouble will be right on the doorstep.* Once that stage is reached the days of P.O.J. 2878 will be numbered.

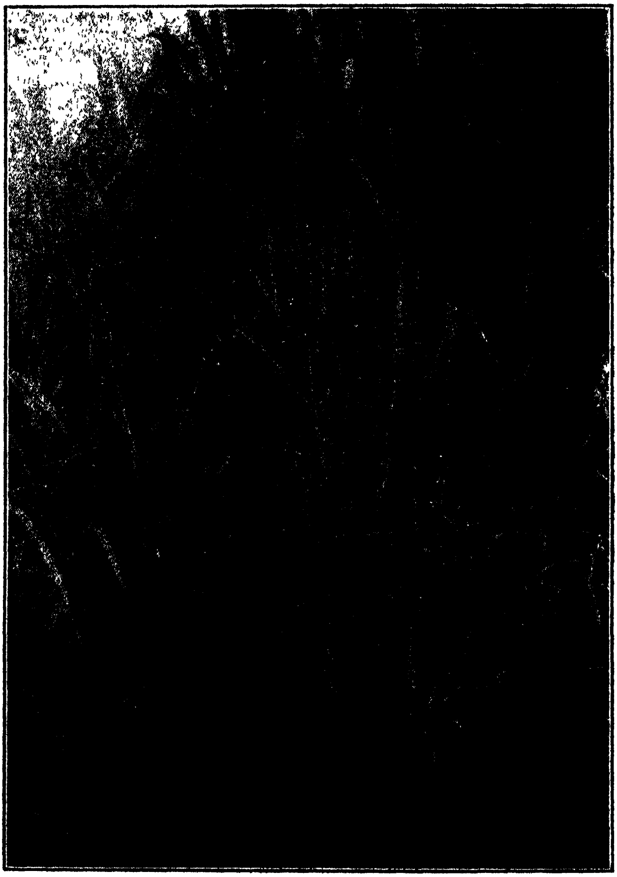

Plate 287.

The two small grass-like stools in the foreground are the result of ratooning diseased stools. The planting of infected cuttings yields a similar type of plant. Variety P.O.J. 2714, all stools nine months old.

Fortunately, if the required small amount of care is exercised now, while the amount of disease is small, the menace may be held in check. A reading of the following notes should enable any farmer to recognise the disease when he sees it and to take the necessary simple measures for its control.

PARATOX BLOW FLY OIL

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JERSEY CATTLE SOCIETY OF Q'LAND,
NEW ZEALAND CHAMBERS, BRISBANE
W. W. MALLET, President. G. T. Nuttall, Secretary.

Symptoms of the Disease.

Fiji disease appears to have originated in New Guinea but first came into prominence in Fiji, where it caused havoc about the beginning of this century. The earliest symptom, and the peculiar characteristic of the disease, is the production of small yellowish galls on the under surface of leaves of diseased cane (see Plate 285). These galls may vary from one to many per leaf; they are formed by the enlargement of the veins of the leaf and might be pictured as a sort of varicose vein; they are usually 1-32 to 1-16 inch in diameter and range from ⅛ to 2 inches in length. In the later stages of the disease the leaves become shortened and erect, very stiff and brittle, and take on a darker green colour. In this stage the cane top often looks as though it had been eaten by some animal (see Plate 286); no further growth now occurs, the leaves become smaller and smaller and eventually the heart dies.

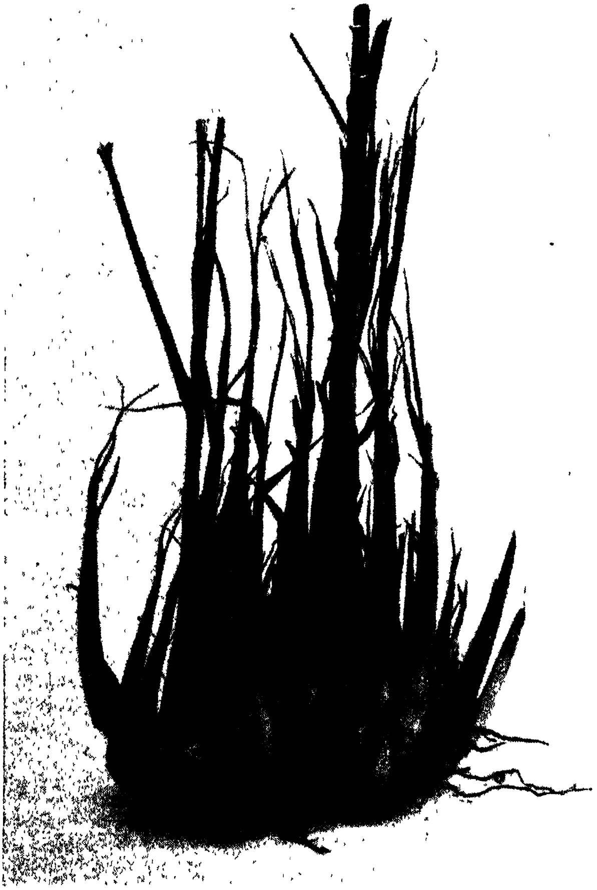

Plate 288.

Clustered stool is often seen in some of the P.O.J. canes and resembles the grass-like shoots of one stage of Fiji disease (see Plate 287). It can readily be distinguished from Fiji disease by the fact that no small galls are borne on the under surface of the leaves.

When diseased setts are planted, or when diseased stools are ratooned, the resultant plants are always diseased and in most cases produce no cane but remain a cluster of grass-like shoots (see Plate 287). An examination of the under surface of these small leaves will show the presence of the small leaf galls described above (refer to Plate 285 again).

The freak known as "clustered stool" (see Plate 288) may be confused with Fiji disease at times. Occasionally some varieties, and particularly some of the high numbered P.O.J. canes, fail to produce a normal stool but give rise to a cluster of grass-like shoots (campare with Plate 287). This condition is due to "sporting" and it may easily be distinguished from Fiji disease by the absence of any small galls on the under surface of the leaves (see Plate 285).

Spread of the Disease.

Experiments carried out some years ago by Messrs. Bell and Mungomery proved that Fiji disease is spread from plant to plant by a small brownish insect, about $\frac{1}{8}$ inch in length, known as the sugar cane leaf-hopper. The insect absorbs infected juice when feeding on diseased cane and then injects it into the next healthy cane on which it feeds.

After the leaf-hopper has infected a new plant there is a lapse of time--sometimes months—before the symptoms appear. Consequently it is impossible to be certain of selecting all healthy plants from the healthy-looking plants in the vicinity of diseased cane.

The leaf-hoppers become much reduced in numbers during winter and spring and usually do not increase greatly in numbers until about December, reaching their greatest numbers about February. It naturally follows, therefore, that spread of the disease is most rapid in the wet season months and least during winter and spring.

Control of the Disease.

In those districts where this disease occurs the following rules should be carefully carried out:—

1. Plant only disease free cane, taken from disease free farms, when susceptible varieties are planted.

2. Inspect all young plant and ratoon cane at regular intervals and dig out any suspicious looking stools. Since the leaf-hopper becomes very scarce during winter, and remains so until about December, the inspection of fields and digging out of diseased stools should be completed by November-December.

3. Do not continue to ratoon diseased crops.

4. The better the conditions for cane growth the better are conditions for the spread of Fiji disease. Therefore, special care is necessary on rich alluvial land or irrigated farms.

5. Where the disease has become established, resistant varieties should be planted in neighbouring fields. P.O.J. 213, P.O.J. 234, Co. 290, Q. 813, Korpi and Oramboo are resistant; H.Q. 285 (Milton) and Mahona are also resistant but are susceptible to gumming disease. P.O.J. 2714, P.O.J. 2725, P.O.J. 2878, 1900 Seedling and D. 1135 are susceptible.

6. Keep a watch on neighbouring fields; Fiji disease is just as dangerous when on the next farm as when on your own farm.

7. Procrastination and indifference are the friends of Fiji disease—never leave until to-morrow any inspection or digging out of diseased stools which can be done to-day. —A.F.B.

Drainage for Wireworms.

THE following notes are issued in respect of the low-land wireworm pest, particularly in the Mackay area. Other species of wireworms may be found in well drained and elevated lands but the damage to cane caused by them is of little consequence, although they are often blamed for bad strikes due to other causes.

As was forecast in the Quarterly Bulletin for July, 1936, damage to cane plantings by wireworms in the Mackay district was both widespread and severe during the spring of 1936. In very many cases the warning issued against early planting went unheeded, with the result that many blocks had to be heavily supplied or replanted. At the Mackay Experiment Station Field Day and again in the Quarterly Bulletin for July of this year it was pointed out that the wet season had been such as to favour the development of wireworms and a warning was again issued against early plantings where drainage was inadequate.

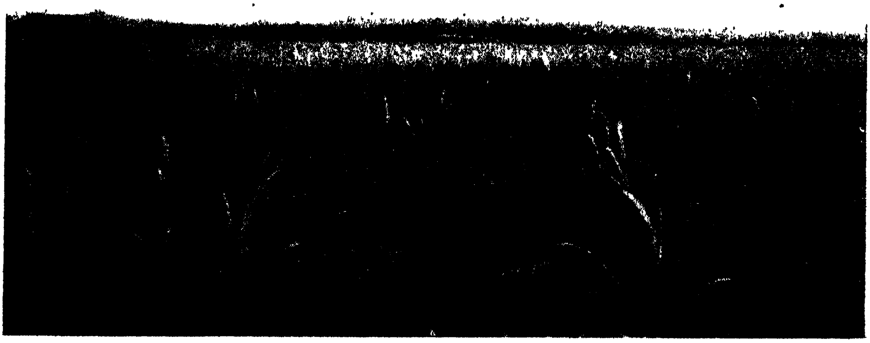

Plate 289.

A poor stand of cane in a badly drained depression due to the eyes of setts having been destroyed by wireworms.

In addition, on each occasion, the necessity for drainage *prior to the wet season* was emphasised. As we have repeatedly pointed out, in its young stages the young wireworm requires extremely wet soil conditions in order to survive, although it can later withstand very dry conditions. It is to avoid providing this extremely wet condition during the rainy season that adequate drainage is necessary.

Severe losses have been caused by wireworms during the current spring and are still being experienced. As is usual at such times many theories and "cures" are advanced, but exhaustive experimenting and practical experience in the Mackay district has proved that the only method of controlling the lowland wireworm pest of cane is to have the land thoroughly drained in readiness for the wet season prior to planting.

Consequently, all farmers who have fields which are to be planted in 1938, and which are liable to wireworm attack, should immediately set to work and provide the necessary drainage. It is realised, of course, that some fields, or parts of fields, cannot be drained satisfactorily and in such cases, following a heavy wet season, planting should be delayed until late September at the earliest.

Advice as to drainage systems or information regarding farms where the wireworm damage has been eliminated by proper drainage, will be given on application to the Entomologist, Sugar Experiment Station, Mackay. Good drainage is not only valuable from the point of view of wireworm control—it is good sound agricultural practice whether wireworms are present or not.

W.A.McD., in the "Cane Growers' Quarterly Bulletin."

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SUGAR-CANE VARIETIES FOR SOUTHERN QUEENSLAND.

Those growers who have not yet experienced the benefits from growing the new gum-resistant canes, which recently have become so popular in Southern Queensland, are urged to include some in their present planting. The results from all trials harvested to date indicate that Co. 290 will produce a much heavier yield than any other variety on practically all types of soil. It generally gives a fair c.c.s. value, while at times very good returns are reported. On damp alluvial lands it tends to maintain continuous growth, and with an "open" winter, heavy cane tonnages with low c.s.s. might result. Such conditions constitute but a small proportion of the lands on which the variety could be planted.

For all-round performance, P.O.J. 2878 is to be recommended strongly. For vigour of growth and drought resistance, it definitely excels, and as a standard cane it has no equal. This is a most important feature, as it enables the Southern grower, on frost-free areas, to revert to the "two-year cropping" methods, which were so popular before gumming disease took its toll, and which enable the grower to effect such a substantial lowering of the costs of production. In these times, when excessively large crops demand that a proportion of the cane be stood over, no cane responds so satisfactorily in its second year of growth as a ratoon crop of this variety.

P.O.J. 2725 is a cane which has shown remarkable yields where mositure conditions are suitable, and it definitely is a valuable cane for irrigated land. Near the coast, it exhibits an unfortunate tendency to arrow early, which is a detriment if the farmer is obliged to stand-over the crop.

—A.F.B.

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FERTILIZING SUGAR CANE.

As the outcome of experiments by the Bureau of Sugar Experiment Stations it has been established definitely that it pays to fertilize sugar-cane crops on all old lands. It is found, also, that there is no one "best kind" of fertilizer for all types of cane soil, but that special mixtures are necessary for particular conditions. The Bureau has devised three special mixtures which are now prepared by all leading manufacturers, and farmers are urged to use these "Sugar Bureau" fertilizers at all times. No. 1 mixture is rich in phosphate, low in potash, and is generally suitable for alluvial and forest lands. No. 2 mixture is suitable for red schist soils and lands requiring a balanced mixture, while No. 3, rich in potash, should be employed exclusively on red volcanic soils.

It should be noted that these mixtures contain very little of the plantfood nitrogen. Their use, therefore, should be combined with top-dressings of sulphate of ammonia.

The following recommendations may be followed as a general procedure:—

Plant Cane.—Apply the appropriate Sugar Bureau planting mixture in the drill with the cane plants, and top-dress with sulphate of ammonia when the crop is stooling.

Ratoon Cane.—Fertilize with the appropriate Sugar Bureau ratooning mixture, in a furrow close to the cane stools. Top-dress with sulphate of ammonia when the ratoon shoots are 12-18 inches high.

Plant cane following a green manure crop will require no top-dressing with sulphate of ammonia, but ratoons always respond to this treatment. Early manuring ensures a vigorous crop, and pays better than late fertilizing.

Sugar Cane in New Guinea.

A. F. BELL.*

WE have recently been favoured with a visit from Mr. W. M. Pestell, of the Department of Agriculture, in the Mandated Territory of New Guinea, and it is thought that some of his remarks may be of more than passing interest to Queensland canegrowers. The opinion is held by botanists that sugar cane probably originated in two parts of the world, namely in India and New Guinea. The Indian canes are of the thin, hard type and are low in sugar content; New Guinea canes are of varied type, but heretofore interest has centred on the so-called "noble" type of which Badila, the Gorus and Mahona, are well-known representatives. Indeed the early collectors of cane varieties in New Guinea collected only the noble types of cane or, in other words, collected only those varieties which gave promise of immediate commercial value. In more recent years, with the expansion of cane breeding activities, attention has been also directed towards the "wild" low sugar types with a view to incorporating some of their vigour and hardiness in seedling canes.

Mr. Pestell is strongly of the opinion that much of the Mandated Territory of New Guinea is still unexplored from the cane variety standpoint and especially does he consider this to be so in the case of the so-called "uncontrolled" areas. This "uncontrolled" territory lies inland on the island of New Guinea and extends from the borders of Dutch New Guinea and Papua down to a line which runs roughly parallel to, and about 50 miles from, the coast. It therefore consists mainly of elevated land, rising from a height of about 600 feet above sea level to culminate in the 13,000 feet of Mount Hagon. Owing to this great range in elevation there is inevitably a great variation in climatic conditions. Sugar cane of various types is widely distributed, growing both naturally and under cultivation, and in places has been observed by Mr. Pestell growing at the astounding elevation of 10,000 feet.

Due, doubtless in part, to the cooler climate, the natives of the elevated lands appear to relish the energy-producing sugar, and they are more agriculturally inclined than the coastal natives; consequently, sugar cane is much more widely cultivated by them than by the natives on the coastal belt. For this reason, and the fact that hitherto "closed" territory is being made accessible, together with the development of aerial transport facilities, it is considered that these elevated lands offer a very promising field for cane collectors. Cane is found growing extensively on other islands, notably New Britain, and also on the coastal region of the island of New Guinea.

The cane is cultivated along with other crops in communal gardens by the natives, each village having one to several gardens situated in its vicinity. A village of 100 people may have some 15-20 acres under general cultivation, cane being a major crop at the higher elevations. The land is cultivated only for a period of 1-2 years and then a new site is selected. No irrigation is practised but the rainfall is well distributed, there being no distinct dry season. Varieties are collected during friendly visits or by raiding parties to neighbouring villages. As a rule the cane is planted in the form of setts but occasionally rooted plants are removed. Plants are not placed in furrows but have the earth heaped up in mounds above them; planting is generally done in an irregular fashion, but in some localities in the interior the stools are set out in rows and the fields squared up. Varieties may be mixed but on the other hand a village may grow only a single variety. Planting is carried out at any time of the year and is usually associated with ceremonial observances designed to propitiate the spirits and ensure the success of the crop.

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* In the "Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations, Dept. of Agriculture and Stock) for October.

The natives select the varieties to be grown mainly on their suitability for chewing and consequently there is a tendency to select low fibred canes which frequently have to be supported by bamboo frames. In this connection it is interesting to note that Badila is regarded as a comparatively high fibred cane! Dried strips of cane rind are used to line the native houses; the cane is split open, pressed under stones, the dried flesh pulled off, and the strips of rind then woven to form a coarse mat. The dried tops are used for bedding. In addition to chewing-cane, the " wild " type of cane is grown as a green vegetable, the young tops being cooked and eaten.

At least three types of cane have been observed; the well-known noble (Badila type) cane, the " wild " cane (thin, hardy and low in sugar) and the " robustum " type, a tall vigorous type which was first observed by the Brandes expedition in 1928. The robustum type is cultivated to some extent but also grows prolifically in the natural state, especially along the rivers. There also appear to be many hybrids and it is of great interest to note that two plants, identified at Kew as being cane-sorghum hybrids, were found growing naturally near Kaiapit, on the Upper Markham River, at an elevation of some 1,300 feet. Naturally growing canes may occupy considerable areas in some places and tracts of some 20-30 acres of an almost pure stand of sugar cane may be observed at times.

Arrowing is generally prolific, and is not confined to a restricted period as in Australia, but varies according to locality and elevation. Arrowing is apparently regarded by the natives as a symbol of maturity, as they frequently will not harvest the cane until it has arrowed.

No comprehensive pathological survey of sugar cane in New Guinea has ever been carried out, but Fiji disease and mosaic have been observed in many localities, the latter being most common in the very wet southern coastal districts of New Britain. Doubtless further surveys would reveal the presence of many more diseases of cane.

It is of more than passing interest to the cane breeder to reflect that these two diseases, and especially Fiji disease, have coexisted with sugar cane in New Guinea down through the ages without gaining the upper hand. It is obvious that in those regions of New Guinea where Fiji disease occurs, the indigenous canes must have very considerable resistance to the disease—otherwise they would have been wiped out ages ago. Now Fiji disease is of great potential importance in Queensland, and especially in Southern Queensland. It is very desirable and, indeed, necessary that the vigour of the noble canes be improved by crossing back to the wild hardy types, and we can see some of the results and possibilities of this procedure in the new P.O.J. canes, which are descended from a wild cane of the Dutch East Indies. Unfortunately, the introduction of this particular strain of wild blood also confers great susceptibility to Fiji disease (and other diseases). It would appear logical, then, that other strains of wild canes should be sought for breeding purposes in regions where long association with Fiji disease has ensured their resistance to it. What applies to Fiji disease may also well apply to other diseases, such as downy mildew. It would therefore appear that the Queensland Sugar Industry, which already owes much to New Guinea, may well profit further by availing itself of the wealth of cane-breeding material still available in that neighbouring but yet largely unexplored island.

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EFFECT OF WINDS ON CANE GROWTH.

The red soil area of the Bundaberg district is characterised by strong winds which blow freely throughout the year. The effect of strong winds on cane growth has been recorded in other cane countries, and the results are marked at the Bundaberg Experiment Station, particularly on the south-eastern corner which is devoted to cane seedlings.

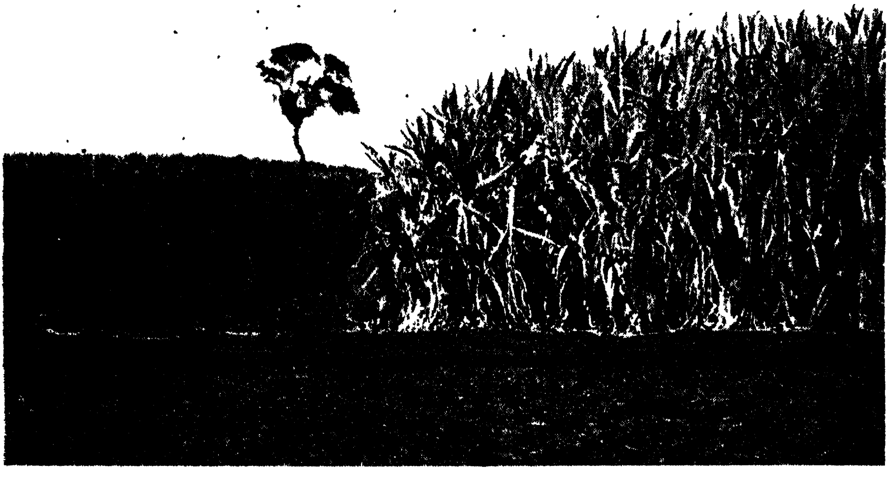

Plate 290.
Depressed growth of outer rows of cane due to action of wind.

To overcome this trouble, a giant privet windbreak has been planted along the southern border of the Station, and is making excellent growth. It is hoped that the protection it will afford in a year or two will minimise the effects of south-easterly winds, which are the most serious.

The accompanying photograph shows very strikingly the effect of wind-blowing on the outer rows of cane of one of the Station blocks.

In passing, attention is directed to the crop of lupins on the left hand side of the illustration.

N.J.K., in the "Cane Growers' Quarterly Bulletin"
(Bureau of Sugar Experiment Stations).

Sooty Mould on Sugar Cane in the Babinda District.

DURING the past two years we have received a considerable number of reports from farmers in the Babinda area that their cane is being badly damaged by sooty mould. The symptoms of this so-called disease are probably familiar to most farmers; during dry weather the leaves, especially lower leaves, become covered with a black sooty deposit, causing the plants to present a dirty sick appearance; it will also be observed that this sooty deposit is worst in patches where the cane is stunted. Actually the cane is not diseased, in the strict sense of the word, although it is not claimed that no stunting results from the "suffocation" of the cane leaves by this sooty deposit.

On turning back the leaves of cane, especially stunted cane, growers may frequently observe colonies of a dirty yellowish aphid on the lower surface of the older leaves. This aphid is known as the cane aphid (*Aphis sacchari*) and as it feeds it secretes a sweet honey dew. The spores or "seeds" of a particular fungus fall on the leaves and germinate and grow in this rich, sweet honey dew without actually penetrating the cane leaf at all. The sooty coating may be rubbed off the leaf with the finger; it is exactly similar to the sooty mould which is so common on the leaves of citrus trees in North Queensland.

The cane aphid thrives during dry weather, and consequently with the advent of a long dry spell, the sooty mould also makes its appearance. On the other hand wet conditions very rapidly kill off the aphid population and the sooty mould disappears again.

Normally, cane aphids are found in appreciable numbers only on the lower older leaves of the cane, and hence the sooty mould which follows them can do little or no harm. However, during prolonged dry spells, and where the cane is already sickly and stunted, the aphid will be found feeding on quite young leaves, and so we soon get the appearance of the sooty mould on such leaves also. Although the sooty mould fungus does not attack the plant directly it seems obvious that it must cover up the leaf pores and cause still further stunting. That is to say the sooty mould does not start the cane on the downward path, but does "kick it when it is down."

It will be seen then that to avoid the effects of sooty mould it is necessary to rectify the cause of the stunting in the first place. During the past season several inspections have been made by members of the Division of Entomology and Pathology—and they have found that sooty mould is definitely worst on the low lands, and particularly so in local badly drained depressions. Although present the disease was very much less marked on the elevated red soils. The chief factors causing the initial stunting on the low-lying areas appear to be 1, inadequate drainage; 2, low fertility or high acidity; 3, chlorotic streak disease. The provision of adequate drainage needs no elaboration and the field officers of the Bureau are at the service of farmers for the purpose of taking soil samples for the determining of the correct fertilizer to be used or amounts of lime per acre required. Chlorotic streak is a disease which has been observed in Java, Hawaii, Puerto Rico and Australia, but its cause still remains obscure. Experiments have shown us that it spreads fairly rapidly in the low-lying areas of the heavy rainfall districts of Queensland, but that it spreads very slowly, if at all, in elevated fields. If diseased cane is planted in a field on a red volcanic hillside, for example, the resultant plants will be diseased, but the disease does not spread into the adjacent healthy cane. Consequently, it follows that in the Babinda area it is bad practice to take cane plants from the river flats up to the hills but, on the contrary, it would help the control of this disease very considerably if the flats could be planted with selected cane from the hills. We say selected cane advisedly, since there is chlorotic streak disease in hillside fields which have been planted with diseased cane. The symptoms of chlorotic streak disease are only visibile in young cane and consequently cane which is to be used for plants in the autumn or spring of 1938 should be selected round about November-December of this year. Such inspections and the keeping of records as to the suitability of individual blocks for plants would require the services of a resident field officer which, unfortunately, the district does not possess. Healthy cane when planted on the flats will definitely contract this disease but the planting of healthy plants enables it to get off to a good start, and experiments carried out by the Bureau have indicated that a nett gain of some 25 per cent. may be expected in both plant and ratoon crops.

Two chlorotic streak-sooty mould resistance trials with over twenty varieties have been planted in the Babinda area this year, and their progress will be watched with interest

A.F.B., in the "Cane Growers' Quarterly Bulletin."

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Some subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Some Tropical Fruits.

No. 17. THE ROSE APPLE.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE Rose Apple is a member of the large family Myrtaceæ, and is a native of India and Malaya. The tree is of medium size and in this country is of bushy habit, making an ornamental specimen. The leaves are about 5 to 8 inches long by 1 to 2 inches wide and are thick and glossy. The young foliage is wine coloured; consequently a tree in young growth is very handsome.

The flowers are produced in terminal racemes on the smaller and younger branchlets. They are white with numerous long stamens which form the most conspicuous part of the flower, almost hiding all the other parts. The fruit grows up to 2 inches in diameter, and is usually round or sometimes slightly elongated. It retains the calyx segments conspicuously on the apex. When ripe it is of a creamy colour, and the flesh a light creamy pink. The ripe fruit is very similar to the common guava both in outside appearance and in texture of the flesh. The flesh is ¼ to ½ inch in thickness, and the large central seed cavity of the fruit contains one round seed about ½ inch in diameter, lying loose in the cavity.

The flesh is similar to that of the guava but is not so highly flavoured, and is much less palatable. The fruit has, however, the distinction of being very sweetly scented, comparable to a highly scented rose. It is this distinction that gives rise to the common name of the fruit. It also makes it popular in some countries as a table decoration. Although rather poor as a dessert fruit it is said to be delicious in the preserved or crystallised form.

The tree is now largely distributed throughout tropical countries. It was probably introduced to Queensland about forty years ago and is now growing well in the tropical part of this State, although at the present time only in limited numbers. The ideal conditions for its growth are a moist and warm climate, with a good, deep, loamy soil, but it seems to be fairly hardy and will thrive under much less congenial conditions. In fact, Popenoe reports that in America it grows on sandy soils and in subtropical climates. However it is, strictly speaking, a tropical fruit.

In Queensland the tree blooms from July to October, and the fruit is in season between September and Christmas. The tree is not a heavy cropper however.

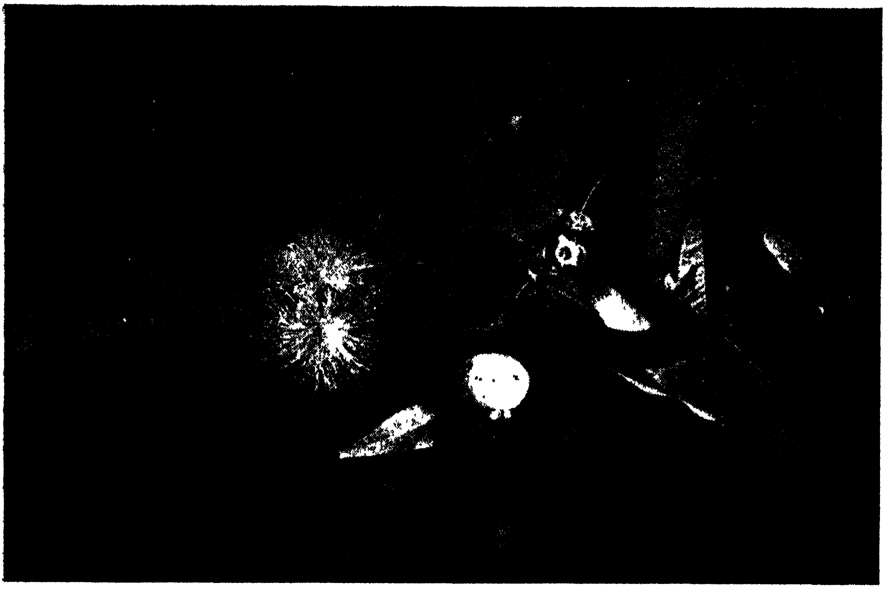

Plate 291.
Flowers and Ripe Fruit of the Rose Apple.

Propagation of the Rose Apple is usually by seed, but P. J. Wester has found that in the Philippines it may be propagated by budding. If a particularly good specimen should be located propagation by this method would be advisable, but the general type met with does not warrant it.

Botanically the tree is known as *Eugenia* jambos (L.), sometimes *Caryophyllus jambos* (Stokes) or *Jambosa vulgaris* (D.C.). The common name of Rose Apple is adopted in most English-speaking countries; Jambu is used in India and Malay; Yambo, Yambosa, Tanpul, &c., are various names applied in different parts of the Philippines.

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Sawdust Packing for Grapes.

JAS. H. GREGORY, Instructor in Fruit Packing.

IN the past, when exporting Australian grapes overseas it has been necessary to use granulated cork as a filler. For many years Australia has been importing grapes packed in sawdust from California during the off season. For a long time, a search for a suitable sawdust has continued in Australia. The main difficulty has been in overcoming wood taint which was absorbed by grapes stored for lengthy periods necessary during storage and transport. Various kinds of sawdust have been used without success, but at last a treated type of sawdust has been obtained which, when packed with grapes and stored for eighteen weeks, left them taint-free. The wood used was Queensland hoop pine.

Another difficulty has been to obtain the size and shape of granule in the sawdust, but with the co-operation of officers of the Queensland Forest Service this has been overcome. Only certain types of saws will throw off a suitable sawdust comparable with the sawdust used for fruit packing in America. For the present, however, only a limited quantity of this sawdust is available. The price, in consequence, is so high that a comparison of the value and the quantity required for a case with that of cork is not favourable enough, for the time being, to warrant the general adoption of sawdust. The cause of this is the very low recovery of sawdust of the required coarseness from the special saw in use. This sawdust is actually finer than that used in America.

Past experience of the use of cork leaves one with the opinion that it might be possible to use a finer type of dust-free sawdust for packing. This would mean a far greater recovery, and therefore a substantial decrease in price. To ascertain definitely if this is possible, further experiments are to be conducted during the coming season. In the meantime, growers are advised not to rush into using any type of sawdust which may be obtainable in their districts without first subjecting it to exhaustive tests as to its suitability for packing and freedom from taint. The sawdust used experimentally was carefully sieved to remove the finest particles, and then carefully dried until only a 12 per cent. moisture content remained. American sawdust is obtained from timbers such as redwood, spruce and Douglas fir. Investigation will probably show that many Queensland timbers can be used for sawdust for fruit packing if treated correctly. Unless definite taint-free dusts are obtainable, great damage might be done to the grape export trade by the use of unsuitable sawdust. It only needs one or two consignments to show signs of taint, and arguments similar to those that arose in respect of butter boxes will immediately be used.

A short account of the experimental test follows:—

Two cases of Servante grapes were packed on the 22nd March, one with cork and the other with sawdust. These were placed in Messrs. Birt & Co's. cold store under the usual trade conditions. The object was to ascertain the extent of the presence of taint, if any, in the sawdust, and also make a comparison between the merits of the sawdust and cork from the following viewpoints:—

(*a*) Taint;

(*b*) Breakdown of fruit;

(*c*) Adherence of packing material to fruit.

The following observations were made:—

(*a*) *Taint.*—With the cork-packed fruit a slight musty corky flavour was noticeable, due no doubt to a minute covering of the fruit with very fine dust. With sawdust no taint was noticeable in the sound fruit, but a few damaged berries had a faint wood taint, caused possibly by the damping of the wood with the fruit juice.

(*b*) *Breakdown of Fruit.*—The fruit in cork definitely showed greater breakdown. A few cases of "nests" of rotting berries were observed. There was a much greater incidence of mould development noticeable on those in the cork filler. The sawdust pack did not show any tendency towards developing "nests" of unsound fruit.

(*c*) *Adherence to Fruit.*—Sawdust definitely does not adhere to the fruit in the same way as the cork. Apparently, it can be cleaned of fine dust better than cork. This causes the bunches to open up much fresher in appearance. Sawdust-packed fruit also maintained better its natural bloom on the skin, looking quite fresh in comparison with the fruit packed in cork.

The weight of sawdust used to the case was approximately 9 lb., as compared with 4 to 5 lb. of cork. These weights would, of course, vary with the type of bunch used for packing, so can only be taken as an example. With the present price of cork at 4½d. per lb., the total cost of packing a case would average about 1s. 6d.

The fruit used was handled in two different ways. One section was picked on Friday morning, 19th March, the other section about 5 p.m. on Saturday, 20th March, a difference of approximately 30 hours before packing. When taken from the case, six weeks later, no appreciable difference could be observed in the appearance of the fruit of either lot. Stalks were slightly shrivelled in both lots. The Servante variety, on account of its tendency to tight bunches, is not altogether a satisfactory type for storage and long transit—the tightness of the fruit making it difficult to trim out the slightly damaged berries which are the causes of "nests" of rotted fruit. These "nests" in the case of this experimental fruit, consisted of up to five berries each.

To ascertain the extent of time available for retailers to handle these grapes when removed from storage, bunches were removed from the sawdust and cork and stored under ordinary room climatic conditions. At the end of four days the bunches were still good in appearance, but at least 20 per cent. of the berries were dropping from their stalks. Bunches left untouched in the packing material were in better condition when removed than those removed the first day, showing an approximate 10 per cent. fall of berries. From the commercial point of view, this is fairly satisfactory.

In analysing these results, it must be remembered that before the harvesting of this fruit very heavy rains were experienced, to the detriment of the keeping qualities of the grapes.

In addition to this, a case of Purple Cornichon grapes was packed on the 5th April, containing two sections, one packed in cork and the other in sawdust. This fruit was displayed in the fruit section in the court of the Department of Agriculture and Stock during the last Brisbane Exhibition, having been 10 days out of cold storage before the fruit was unpacked. The following observations were made:—

By the end of the exhibition, the grapes had started to show signs of shrivelling with both types of filler.

The fruit in sawdust was definitely in better condition than that in cork.

The fruit packed in cork had a tendency to show "nests" of decayed fruit; the sawdust pack was comparatively free from this fault.

No signs of taint could be noticed in the fruit packed in the Queensland sawdust, but the cork-packed fruit had a very slight musty flavour.

Berries in both packs had reached their limit of storage, and showed a marked tendency for dropping from the stems.

ACKNOWLEDGMENT.

An acknowledgment is due to officers of the Queensland Forest Service for their co-operation in obtaining and treating suitable timber; to Messrs. Birt & Co. for cold storage facilities and attention; and to Mr. R. L. Perkins, of Ballandean, for making the fruit available.

THE CONTROL OF THE RED-SHOULDERED LEAF BEETLE.

N. E. H. CALDWELL, B.Sc., Agr., Assistant Research Officer.

The red-shouldered leaf beetle has again made its appearance this spring, notably on citrus orchards in the Maroochy district, where it has been damaging flowers and foliage to a serious extent. In recent trials, dusts containing either or both pyrethrum and derris as toxic ingredients were used on citrus trees carrying a fairly heavy infestation of beetles. The results with pyrethrum were particularly satisfactory. There was an almost complete drop of semi-paralysed beetles within a few minutes, and observations suggested that only a very small proportion of these recovered sufficiently to fly or to climb the trunks of the trees.

Growers are, therefore, recommended to combat this pest by the use of a pyrethrum dust. If pure pyrethrum is purchased, it can be mixed with equal parts by weight of kaolin (a cheap filler) to reduce the cost of the treatment. As derris is somewhat slower in action and considerably less effective against this pest than pyrethrum, dusts containing the former insecticide alone cannot as yet be recommended for the control of the red-shouldered leaf beetle.

Dusting should be done in the early morning when the beetles are relatively sluggish and less apt to fly away when dusted. The lower temperatures prevailing at an early hour do not appear to impair the efficiency of the dust.

Dusting should be thorough and, in the case of a large tree, should be done both inside and outside the tree. Each insect must come in contact with the dust, either directly as it comes from the duster or indirectly as the beetle moves over foliage carrying a layer of dust. It is not necessary, however, to use excessive quantities of the dust. A fine cloud of dust passing through the tree is all that is required.

A number of beetles will be observed, in the early mornings at least, on any weeds under the trees. These should also be treated. In any case, some little time after the tree has been dusted, the beetles which have fallen to the ground should be given a light dusting to make sure that every one receives a lethal dose of the poison.

This method of dealing with a pest that has for years been a periodic worry to growers of many crops is easy to apply, effective and reasonably cheap.

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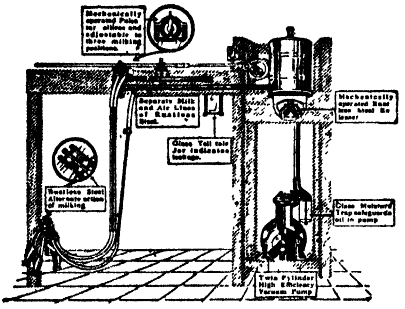
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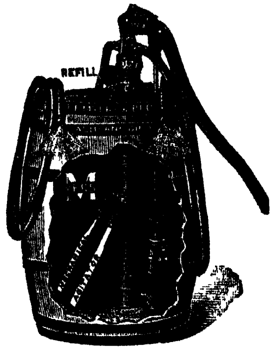

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Strawberry Culture.

W. G. HANCOCK, Fruit Branch.

At the present time, two strawberry cultural matters are due for consideration: (1) The treatment of old beds for next year's crop; and (2) Runner production for next year's planting.

The peculiarities of the strawberry in forming new main roots from higher parts of the stem is often overlooked, but nevertheless it is a very important characteristic which should be taken into account. The cultivated strawberry has inherited this habit from its woodland ancestors, which every year after cropping in the summer were half buried by the autumnal fall of leaves from the trees above them. Thus, after the strain imposed upon the plants by the crop, they are annually re-invigorated by the leaf mulch.

In applying this to Queensland, it requires to be kept in view that, under European conditions, the strawberry fruits in the summer and rests during the winter; while here it fruits during the winter, and subsequently undergoes, to it, very trying conditions during summer. In addition, therefore, to providing a medium to support the freshly-forming roots, a thick mulch will keep the top of the soil cooler and moister during the summer, and thus help to offset the rigours of a sub-tropical summer on a temperate plant: The result will be stronger plants for next year's crop, and better and stronger runners for next year's planting.

On the question of runner production for next year's planting, in most countries what is referred to as runner deterioration has been noted, and an improvement in the quality of plants with a view to arresting this tendency has been sought.

It has been definitely confirmed that a restriction in the number of runners per plant results in the production of better runners for planting out, and better fruit production. Five should be the general rule. An authority goes so far as to recommend that (1) a special bed be planted for runner production; (2) after the plants have become established, all weak diseased or abnormal plants be pulled out; (3) pick off the blossoms as they form; (4) allow five runners to each plant and stop after the first runner plant.

Strawberry growers would do well to give these recommendations a trial next year. Meanwhile, measures should be adopted to keep the plants strong and healthy with the object, firstly of having the old plants in better shape next year for cropping, and, secondly, to encourage the formation of strong runners for future planting. These consist of (1) clean-up and cultivate old beds; (2) fertilize; (3) draw up the soil to the plants and mulch with leaf mould or litter; (4) restrict the runners to five and stop after the first runner; (5) keep the beds free from weeds and irrigate when necessary, so that the plants shall not suffer from lack of moisture.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE recent heavy rains have been a welcome relief to all engaged in fruitgrowing. Localities near Brisbane have, however, had too much wet weather for some crops, especially tomatoes. From now until the end of the month, good quality tomatoes should maintain firm values. Stone fruits have also been affected adversely by the weather. Growers of stone fruits are advised to use the direct factory outlet for as much as possible, and so assist in avoiding an oversupply. Fruit sent to market and withdrawn later for factory use has the tendency to cause prices to ease. Direct consignments assist in obviating the chance of difficulties of this sort arising.

Prices at the end of November:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish—sixes, 4s. 6d. to 9s. a tropical case; sevens, 5s to 12s.; eights and nines, 6s. 6d. to 12s. 6d. Bunches—Cavendish, 1½d. to 5d. per dozen; Lady Fingers, 4d. to 9d. per dozen.

Sydney.—Sixes, 10s. to 16s.; sevens, 16s. to 19s.; eights and nines, 19s. to 22s.

Melbourne.—Sixes, 12s. to 15s.; sevens, 15s. to 17s.; eights and nines, 17s. 6d. to 19s.

Pineapples.

Brisbane.—Smoothleaf, 7s. to 10s. per case; loose, 2s. to 8s. per dozen. Ripleys, 9s. to 11s. per case; loose, 1s. 6d. to 7s. per dozen. Some nice northern fruit has been seen on the local market.

Sydney.—8s. to 12s.

There are reports of leaky fruit on both Melbourne and Sydney markets.

Melbourne.—10s. to 16s.

Growers are warned to note that pineapples at the present time are ripe when showing very little colour. They should notify their agents to this effect.

Papaws.

Brisbane.—Yarwun, 8s. to 10s. a tropical case; Gunalda, 5s. to 6s. a bushel case; Locals, choice, 3s. to 5s. a bushel case.

Sydney.—10s. to 14s. per tropical case.

Melbourne.—10s. to 14s. per tropical case.

Mangoes.

Brisbane.—5s. to 8s. per case.

Sydney.—6s. to 8s. per case; selected types higher.

Melbourne.—Half-bushels, 5s. to 7s. Only selected types should be sent to the Southern States.

Passion Fruit.

Brisbane.—First grade, 7s. to 10s. per half-bushel; seconds, to 6s.

Sydney.—8s. to 18s. per half-bushel.

Melbourne.—12s. to 20s. per half-bushel.

CITRUS FRUITS.

Oranges.

Brisbane.—8s. to 10s. per case. Second crop fruit practically unsaleable.

Lemons.

Brisbane.—Gayndah, 10s. to 14s. per case; Byrnestown, 14s. to 15s. per case; Locals, 6s. to 9s. per case.

STONE FRUITS.

Peaches.

Brisbane.—Stanthorpe peaches are now in season The quality appears to be an improvement on early consignments of past seasons.

China Flats, 1s. to 2s. per tray; specials higher.

Stanthorpe Mayflower, 4s. to 6s. per half-bushel.

Plums.

Brisbane.—Stanthorpe Wilsons, 2s. to 6s. per half-case; New South Wales Wilsons, 2s. to 5s. per half-case; choice grades higher.

Cherries.

Brisbane.—Stanthorpe, 7s. 6d. to 9s. per case; New South Wales, 6s. to 8s. per case.

Many lines opened wet, apparently through being packed and nailed down during adverse conditions.

Apricots.

Brisbane.—Warwick, 4s. to 8s. a half-bushel; Stanthorpe, small varieties, 4s. to 7s. per half-bushel; choice, 8s. to 10s. per half-bushel.

As Brown Rot is likely to develop rapidly under the present climatic conditions, growers should take all care to see that possible skin damage is reduced to a minimum. The use in the packing shed of a solution of 1 part of formalin to 20 parts of water as a cleanser is suggested. Picking and packing utensils should be sprayed with or dipped in this solution at least once a week.

Tomatoes.

Because of weather conditions the quality has fallen off. Only firm lines are wanted on the markets, soft fruit being almost impossible to sell.

Brisbane.—Ripe, 1s. to 3s. per half-bushel; green, 2s. to 3s. 6d.; coloured, 2s. 6d. to 4s. 6d.; few specials higher.

Sydney.—Queensland, 1s. to 3s. 6d. per half-bushel. Market oversupplied.

Canteloupes.

Brisbane.—5s. to 8s. per dozen, only light supplies available.

Sydney.—5s. to 8s. per bushel.

Melbourne.—8s. to 10s. per bushel case; some higher.

Apples.

Southern shippers are warned not to send apples to this market, except Yates and Crofton, or similar hard varieties. Many lines are now opening up soft and do not keep.

Brisbane.—Yates, 5s. to 10s. 6d. per case; Crofton, 7s. to 10s. 6d. per case; Democrat, 5s. to 9s. per case.

Pears.

Winter Coles, 10s. to 16s.; Winter Nelis, 9s. to 14s. per case; Josephine, 11s. to 14s. per case.

VEGETABLES.

Marrows.

No demand on any market; prices in Melbourne and Sydney unpayable.

Brisbane.—6d. to 2s. per dozen.

Sydney.—2s. to 4s. a tropical case.

Melbourne.—4s. to 5s. a tropical case.

Cucumbers.

Brisbane.—1s. to 2s. per bushel case.

Sydney.—1s. to 5s. Market over supplied.

Melbourne.—2s. to 5s. per bushel.

Peas.

Brisbane.—4s. to 6s. per bag.

Beans.

Brisbane.—6s. to 8s. a sugar-bag.

Lettuce.

Brisbane.—1s. to 1s. 6d. per dozen.

Cabbage.

Brisbane.—3s. to 5s. Inferior lower.

Chocos.

Brisbane.—9d. to 1s. 3d. per dozen.

PUBLICATIONS.

"Passion Fruit Marketing" is now available. "Tomato Marketing" is in the hands of the printer.

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CHRISTMAS TELEGRAMS.

The Deputy Director, Posts and Telegraphs (Mr. A. B. Corbett), advises that arrangements have been made for Christmas and New Year greetings, sent by telegraph between the 20th December and 6th January, to be delivered on appropriately designed and coloured telegraph forms enclosed in pleasing and attractive envelopes.

These greeting messages should be written on the usual telegraph forms and lodged at any telegraph office, the word "Greeting" being added at the top of each form used. Telephone subscribers may send their greetings by means of the Phonogram Service. No additional charge is made for greeting telegrams—the usual telegraphic rates apply.

Greeting telegrams are also being accepted for transmission to places abroad at reasonably low rates, particulars of which may be obtained at any Post Office.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled during the month of October, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD 350 LB.).			
Villa Maria Broady 5th	W. Henricksen, Ardilea, Clifton	9,273·0	459·688	**Villa Maria Sir Charles**
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Morden Nessie	W. Henricksen, Clifton	7,047·75	271·246	Morden Stirling
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
College Granny 5th	Queensland Agricultural High School and College, Lawes	6,156·3	259·468	Duplex of Greyleigh
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Alfa Vale Beauty II.	W. Henricksen, Clifton	7,361·25	280·428	Reward of Fairfield
College Flash 2nd	Queensland Agricultural High School and College, Lawes	6,022·95	231·948	Duplex of Greyleigh
	JERSEY.			
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Glenview Blossom	W. S. Kirby, Byrnestown	4,677·9	292·092	Glenview Goldfinder
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Inasfayl Dark Flower	McGeehan Bros., Kairi	6,683·45	312·852	Oxford Royal Renown
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
College Linda	Queensland Agricultural High School and College, Lawes	4,297·94	234·761	Belgonia Peggy 9th's Duke
	FRIESIAN.			
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Ryfield Favourite 2nd	F. C. Noller, Kumbia	6,318·65	263·837	**Ryfield Argus 2nd**

The Tropics and Man

Mental Capacity.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology,
University of Queensland.

Second Series: No. 5.

THIS aspect of tropical residence is one that naturally concerns an academic mind, but it is really of equally vital concern to every tropical dweller. None of us works with hands alone, and all our work goes for little unless part of a well-reasoned plan. The capacity of the individual to think for himself is as important as that of the organiser, particularly in the existing democratic state.

Handicaps upon the Nervous System.

It will be clear to you by now that the nervous system is placed at a certain disadvantage in hot climates by reason of a less reliable blood supply and by the threat of water deficiency within the body. There are probably other less obvious changes in hot climates which also affect the nervous system. The nerve cells are probably susceptible to changes in the blood a thousand times smaller than those we can measure by present means. To investigate these by modern methods is like fixing a watch with a crow-bar. The nerve-cells are susceptible especially to the secretions of the ductless glands, and there is a good deal of evidence that the balance of these glands is altered in hot climates.

Common Results.

Irritability is very common in tropical dwellers, particularly towards the end of a long spell of trying weather or hard work. In certain countries almost universal irritability, mounting frequently to uncontrollable anger, habitually follows a hot dry wind (mistral, foehn, sirocco). On the other hand, many mental disturbances have been attributed to climate when there is really some other cause. The "amok" of the Malaysian is probably due, for instance, to cerebral malaria.

Sleeplessness is also common, particularly in coastal areas when the night-time conditions are little better than the day-time. The necessary mosquito-net effectively cuts out what breeze is going and makes matters worse. This very real and common handicap can be partially overcome by using a net with a large upper surface made of netting, not calico, and by fixing a fan above the net. The fan should run at the lowest speed, and should be kept sufficiently distant to avoid draughts upon the sleeper.

Lack of concentration must be familiar to all who indulge in critical brain work. There is unwillingness to fix the mind and an inability to grasp details easily. The fatal spirit of manana ("to-morrow") steals in so unobtrusively that its presence is not realised until it is firmly established. It is only the strongest mind that can resist these changes, and then all too frequently at the expense of the bodily health.

Boredom is a very similar process, and is especially noticeable in equatorial islands where the climate hardly varies from one year's end to the other. The greater part of tropical Australia is fortunate in having distinct seasons, at least in respect to man's personal life. The same alternation of seasons brings difficulties, however, to agriculture, particularly in the Northern Territory.

The reactions to these mental handicaps are sometimes excessive, and may then become anti-social. The terrific drinking and loose-living beloved of tropical writers (some of whom do not know the difference between mango and mangrove) is grossly exaggerated. Nevertheless, there is, I think, a greater tendency to turn to alcohol and other diversions in hot climates as an escape from boredom, insomnia, and isolation. Where the line is to be drawn between legitimate diversion and excess is a matter for individual opinion; but there can be no doubt, I think, that there is a drift away from the moderate towards, if not actually to, the excessive in tropical climates.

Mental Production.

Can mental work in the tropics reach the same quality as mental work in temperate countries? Can there be the same quantity of good mental production in the tropics? Is an attempt at maintaining temperate standards harmful to the body?

That mental activity of outstanding quality can be carried out in the hottest of climates and under the most unpromising conditions is quite clear, as the history of tropical medicine shows. This branch of medical science has been fostered by a host of brilliant men working under these very conditions; such famous names as Manson, Bruce, Rogers, Findlay, immediately spring to mind.

That the quantity and continuity of such work could be maintained, or that the good average brain-worker as distinct from the genius, could be as successful under tropical conditions is another matter. To compare the intellectual output of, say, Queensland and England, is not a fair test. Although the position is now rapidly improving, Queensland flowers all too often bloomed unseen by the rest of the world, or else were transported to England or America and quickly absorbed into and reckoned as part of the horticultural displays of those countries. I know of five very well-known English medical men who are, in reality, Australian products.

In view of the very frequent signs of interference with mental activity in the tropics, I doubt whether temperate standards of intellectual production can be maintained in quantity, at any rate by us ordinary mortals. Having worked successively in England, Signapore, and Brisbane, I have no illusions as to the relative productivity in my case, nor as to the relative effects of winter and summer months. Under emotional stress the mental activity may be artificially maintained for a while, but it usually turns out to be at the cost of general bodily efficiency and health.

Stabilisation.

Undoubtedly, one can make or neglect to make the best of circumstances. As I have suggested, even under the best of circumstances, I doubt whether one can realise one's full mental capacity in hot weather. It is very important, therefore, that all possible factors should be controlled to give the best working conditions. These improvements fall under four headings. If observed, they should minimise tropical interference with mental activities.

(1) *An Ordered Life.*—Nowhere is it more essential deliberately to arrange one's life for the best. A sufficiency of the best food (not necessarily the dearest, by an means), plenty of fluids, regular exercise, adapted to the body's requirements, periods of mental and physical relaxation definitely set aside and conscientiously observed, and good living conditions are essential. The degree to which one can abuse one's bodily and mental requirements with impunity is very much diminished in hot climates.

2. *Fixed Interest.*—Undirected amateurish mental pottering quickly degenerates into mental idleness. A definite interest must be created and a goal set up. The objective must be maintained even if, as will almost certainly be the case, a certain amount of flogging is needed to keep oneself up to it. The setting aside of definite times and the mapping out of a programme are very useful tricks for setting the pace. The only thing is, to set a reasonable pace, which will generally be a bit slower than the pace usual to temperate countries.

3. *Keeping up Contacts.*—Isolation is a great handicap to mental work in many tropical places, and often a danger. Deliberate attempts must be made to keep up contacts with other parts. This is now becoming easier by reason of air mails.

4. *Regular Holidays.*—A system of regular holidays is essential to the brain-worker. The advantages are two-fold—a relief from tropical stresses and an opportunity to re-establish contacts with fellow workers.

THE COMPOST HEAP.

One of the most economical methods of gaining good growth in the orchard is with the contents of the compost heap. Besides supplying a readily available plant food, the condition of the soil will be greatly improved by the added humus. It is surprising to note the variety of waste substances which can be put to profitable use in the compost heap. Farmyard manure, straw, weeds, dead leaves, and, in fact, almost all organic substances, both animal and vegetable, may be used. The size of the heap will be regulated by the quantity of material available from time to time, but provision should be made for a second heap so that the first heap may be topped off with a layer of soil and left to mature, from three to four months usually being sufficient for the process of conversion. In this way, a continuous supply of humus will be available.

If practicable, the heap should be built on a concrete base and framed with saplings. After each collection of refuse is added, dust the heap with lime and add a layer of earth. The heap should be kept in a moist condition. Overheating may be avoided by the use of more earth, which will absorb the ammonia given off in the process of fermentation.

When it is realised that the compost heap uses materials which would otherwise be wasted and converts them into a very valuable manure, it is a pity that its use is not more general.

The Apiary

As the season advances, the super combs will become capped over and are then ready to be taken off for the purpose of extracting the honey. The beekeeper will require to exercise some judgment as to when the honey is ripe enough to extract. Coastal districts, especially in heavily-timbered areas, are remarkable for the dampness of the atmosphere. In these districts it is a very safe plan to permit the cappings of the honey to extend over the entire comb face before removing it from the hive. Even then, the honey in these wet districts is of a rather thin character; in fact, it is almost impossible to attain the density of honey gathered from inland localities. On the other hand, in dry and hot localities the nectar ripens quickly, and the combs are ready to extract when the capping covers approximately half the comb face. Indeed, inland honey occasionally becomes so dense that considerable difficulty is experienced in extracting it. This sometimes occurs when a cold change, without rain, follows hot weather with a good honey flow. Unless it is unavoidable, honey should not be taken off when the weather is cold, as it will then be necessary to store the combs for a few days in a warm room in order to extract the honey.

There are machines on the market for ripening honey, but the majority of beekeepers leave the honey in the hives in preference to the artificial process. At times the honey flow is so heavy that the super is soon filled with unsealed honey. If the beekeeper now neglects to supply further storage room, the bees will almost invariably store honey in the brood-combs and crowd the queen for egg room. This is the chief cause of swarming at any season of the year. It also causes the bees to build a number of burr combs on the tops, sides, and bottoms of frames, making their removal a test of patience. Should the bees fill the super before any of the honey is ripe, it is advisable to furnish yet another super of foundation.

In order to improve the appearance of newly-extracted honey, it is a good plan to lay a piece of fine mesh cheese-cloth over the wire strainer of the tank. Although it causes the honey to be slow in passing through, it will catch a greater proportion of the scum. This is comprised of small particles of wax, pollen, and also air bubbles that have been forced through the honey during extraction. The honey should be permitted to stand in the tank to settle for a week when any remaining scum may be skimmed off the surface, after which the honey may be run into tins or bottles for market.

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THE DAIRY FARM.

Large paddocks on a dairy farm are not economical. If practicable, the farm should be subdivided into a number of small paddocks, which allows for each to be grazed in turn, and then spelled for a period to enable the paddock to recover. Large paddocks often mean fodder wastage, as cattle roam all over the area, eating out the choice grasses and fouling the remainder, making them unfit for food.

A lot of waste results from faulty management of good pastures by stocking too heavily, which means, of course, that good grasses are eaten up quickly. If the paddock is spelled for a reasonable period, the pasture gets a chance to recover and the grasses have time to seed.

Unwise feeding methods constitute a prolific source of waste. It is necessary to balance the ration so that there will be no waste or loss in production through feeding an excess of one food constituent at the expense of another.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

A Common Weed. Hexham Scent.

J.J.S. (Helidon)—

1. *Fumaria parviflora*, the fumitory. A moderately common weed in Queensland. It is not known to possess any poisonous or harmful qualities.
2. *Melilotus indica*, melilot or Hexham scent. This plant was "boomed" as a fodder in Australia some years ago under the name of King Island melilot, but our experience in Queensland has been that stock do not take very readily to it, and have to become accustomed to its peculiar odour and flavour. It has the great disadvantage of tainting milk and cream rather badly. It is short-lived, being at its best during spring, dying off at the approach of hot weather towards the end of October or early November. As a fodder plant for Queensland for winter and spring months it is poor compared with some of the annual trefoils and clovers, such as the common burr trefoil and cluster clover.

It is a common weed of wheatfields, and if reaped with the wheat and stored for any period the peculiar penetrating odour is communicated to the flour and bread made subsequently.

Burr Grass. Chinese Burr. Chaff Burr.

T.G. (Cathu, North Coast Line)—

1. *Cenchrus australis*, burr grass. A native grass very common on scrub edges, hillsides, and similar places throughout the whole of coastal and near-coastal Queensland. It is very common in some pastures in North Queensland and on the Atherton Tableland is known by the rather absurd name of Scotch lice.
2. *Triumfetta bartramia*, Chinese burr.
3. *Achyranthes aspera*, chaff burr. So far as is known there is no easy method of getting rid of this plant. Frequent cutting, of course, will eventually exhaust them with the exception of the grass.

Numbers 2 and 3 probably would succumb to weak arsenical solutions or spraying with Weedex. Weedex would be preferable, as it is not known to be harmful or poisonous to stock in the weaker solutions used for weed poisoning. The Agricultural Chemist, Department of Agriculture and Stock, Brisbane, will give you the suitable strengths of the various poisons used.

Kangaroo Apple.

W.H.G. (Goondiwindi)—

Your specimen has been identified as the kangaroo apple, *Solanum aviculare*, a native plant and a weed of new burns, although it is not, of course, confined to such country. The berries are poisonous. The plant is generally left untouched by stock, but it is recorded that the young shoots, when nibbled by sheep, have caused death.

Dog Burr.

D.G. (Kangaroo Point)—

The specimen is *Bassia tricuspis*, a close relative of the galvanised burr and the black roly-poly of Central Queensland. The only local name we have heard applied to it is Dog Burr. It is very common in parts of Queensland, particularly in the Western Darling Downs and Maranoa districts, but we have received specimens from as far north as Clermont. It is a native plant and, apart from its burr nature, is not known to possess any poisonous or harmful properties.

South Burnett Plants Named.

F. (Leafdale, Wondai)—

1. *Silybum Marianum*, the variegated thistle, a very common thistle on the Darling Downs and in the Southern States. It has been thought at times —when eaten in large quantities—to have caused the death of stock, particularly sheep, but this has not been verified by feeding tests.
2. *Argemone mexicana*, Mexican poppy or prickly poppy. This weed is known under various local names, such as silver thistle and Californian thistle. It is, however, a member of the poppy family and not a true thistle. It is reputed to be poisonous, but is rarely touched by stock as, in addition to its spiny nature, it possesses an extremely bitter sap.
3. *Centaurea melitensis*, star thistle or Maltese thistle.
4. *Carthamus lanatus*, saffron thistle.

Nos. 3 and 4 are two very common thistles in the Southern States, much more abundant there than in Queensland, but both, particularly No. 4, seem to be on the increase. All the abovenamed are annual plants and call for no special methods of eradication, other than those usually employed in cultivation.

5. *Physalis lanceolata*, ground cherry or wild gooseberry. This plant, a native of North America, has been observed in several places in Queensland, particularly on the Darling Downs. It is a much more serious pest than any of the others you have sent. The Council for Scientific and Industrial Research have it on their list of weeds for investigation. The only method of control, so far as we know, is to keep the green shoots regularly cut off as they appear above the ground so as to exhaust the old roots eventually. If preferred, they could be periodically destroyed by spraying. This would have to be done several times as these plants have an underground stem system. Poison is not always effective on such plants—simply "burning off" the tops and leaving the parts under the surface to send out fresh shoots. Every effort should be made to keep it within bounds, and not let it spread by means of seed or pieces dropped here and there.
6. *Polygonum convolvus*, climbing buckwheat. Much the same remarks apply to this as to Nos. 1 to 4.

"Red Head" or Red Cotton Bush.

M.R.I. (Rockhampton)—

The specimen has been identified as the red head or red cotton bush, *Asclepias curassavica*. This plant is poisonous to stock and, among other symptoms are those of gastro-enteritis. However, in normal seasons, the plant is generally avoided by stock.

The Age of a Horse.

A.W. (Sarina)—

The following verses are printed in compliance with your request for a convenient form of memorising ways of telling the age of a horse:—

To tell the age of any horse,
Inspect the lower jaw, of course;
The six front teeth the tale will tell,
And every doubt and fear dispel.

Two middle nippers you behold
Before the colt is two weeks old;
Before eight weeks, two more will come,
Eight months the corners cut the gum.

The outside grooves will disappear
From middle two in just one year;
In two years from the second pair—
In three years "corners" too are bare.

At two the middle "nippers" drop;
At three the second pair can't stop;
When four years old the third pair goes,
At five a full new set he shows.

The deep black spots will pass from view
At six years from the middle two;
The second pair at seven years,
At eight the spot each corner clears.

From middle "nippers" upper jaw,
At nine the black spots will withdraw;
The second pair at ten are bright,
Eleven finds the corners light.

As time goes on the horsemen know
The oval teeth three-sided grow;
They longer get, project before,
Till twenty—when we know no more.

General Notes

Staff Changes and Appointments.

Mr. A. Nagle, Senior Instructor in Cotton Culture, has been transferred from Rockhampton to Biloela.

Mr. K. D. Hoffmann, Inspector, Diseases in Plants Acts, has been transferred from Dayboro to Nambour.

Messrs. S. C. O. Jessop and E. T. Lewin, Inspectors of Stock at Toowoomba and Dalby, respectively, have been appointed also inspectors under the Dairy Produce Acts.

Mr. H. Spottiswood, Clerk of Petty Sessions, Ayr, has been appointed also chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards, and also an agent of the Central Sugar Cane Prices Board for the purpose of making inquiries under Section 5 (2A) of the Regulation of Sugar Cane Prices Acts in regard to sales and leases of assigned lands.

Mr. O. St. J. Kent, B.Sc., A.A.C.I., Analyst, Agricultural Chemical Laboratory, has been appointed Senior Dairy Technologist, Dairy Research Laboratory.

Mr W. G. McKechnie, A.A.C.A., Analyst, Agricultural Chemical Laboratory, has been appointed Assistant Senior Analyst Agricultural Chemical Laboratory.

Mr. H. W. Ball, Assistant Experimentalist, has been appointed Experimentalist and Senior Clerk, Agriculture (General) Branch.

Mr. A. A. Salmon, Clerk, Chief Office, becomes Assistant Photographer, Publicity Branch.

Mr. S. C. Mossom, Court House, Innisfail, has been appointed chairman of the Goondi, Mourilyan, South Johnstone, and Tully Local Sugar Cane Prices Boards, and also an agent of the Central Cane Prices Board for the purpose of making inquiries under Section 5 (2A) in regard to sales and leases of assigned lands.

Constable C. H. Lowe (Mount Morgan) has been appointed also an inspector under the Brands and Slaughtering Acts, and Constable A. Bartkowski, of Westwood, has been appointed also an inspector under the Slaughtering Act.

The following appointments have been made in the Department of Agriculture and Stock:—

Division of Plant Industry (Research).

Mr. J. Harold Smith, M.Sc.Agr., Entomologist, has been appointed Senior Research Officer, Entomological Section

Mr. R. E. Soutter, Agricultural Research Officer, to the position of Senior Research Officer, Agricultural Section.

Mr. W. A. T. Summerville, M Sc., Entomologist, Science Branch, to be Senior Research Officer, Horticultural Section.

Mr. H. K. Lewcock, M.Sc (U.S.A.), B.Sc.Agr. (Adel.), Pathologist, to be Senior Research Officer, Plant Physiology Section

Mr. W. D. Francis, Assistant Botanist, to be Botanist, Botanical Section.

Wild Life Preservation.

An Order in Council has been issued under the Animals and Birds Acts extending the boundaries of the present sanctuary embracing Bald Hills Paddock and Nulla Waterhole on Salisbury Plains Station, in the Bowen district, and including the property adjoining belonging to Mr. A. Jensen.

An Order in Council has been issued under the Animals and Birds Acts, declaring an area embracing Macintyre Brook, Glenelg Station, Inglewood, to be a sanctuary for the protection of animals and birds.

The reserves for waterworks R. 426 and R. 151, Teddington, near Maryborough, have been declared a sanctuary under the Animals and Birds Acts, and it will be unlawful to take or kill any animal or bird within the boundaries of this sanctuary.

Grade Standards for Plums.

A regulation has been issued under the Fruit and Vegetables Acts prescribing new grade standards for plums. These standards provide that all plums must be graded according to size.

Rural Topics

When Buying a Pig.

It is not every day that we buy a pig, so it is worth while remembering a few points when considering the purchase of stores. Having decided the class and type of animals required, the next thing to do is to inspect the pigs on offer. Move them around and inspect each one individually, observing defects like rupture, rough, course skin and hair, and estimating what is the real and not the apparent, average weight.

A point that cannot be overstressed is that if a pig sale is attended for the purpose of purchasing stores and there is nothing really suitable on offer, or the prices are too high, it would be wise from a financial point of view to forget all about them.

Far too many people just buy because that was their original intention, forgetting the point as to whether the pigs put up for auction are worth a higher bid.

It is important to know the highest figure that should be bid, and the one which will turn out to be economically sound when the pigs are fattened up to pork or bacon weights. The class and age of the animals, of course, must be considered, but it is just as well to make sure that there is a reasonable margin of profit in prospect when the pigs go eventually to the butcher or the bacon curer. Only a simple calculation is needed, and the error, if any, should be on the low side, for optimism may turn out to be monetarily disastrous.

It is impossible to get away from the fact that some people are born salesmen or born buyers, but the qualities of both can be cultivated. It is a good thing to know just when to "get on" or "get out," but that knowledge must go hand in hand with sound practical farm management. A note of warning: Cheap pigs in low condition are no good to any man, and must eventually cause a heavy instead of a light expenditure.

Farmers' Breeding Flocks.

The want of the right type of ewe in the breeding flock is the Queensland fat lamb raisers' present difficulty. As a straightout breed the Corriedales should meet the requirements to the greatest extent. The sheep selected for the purpose should be of the true Corriedale type, possessing large, deep, well-formed frames and producing a long fleece of 56s 58s spinning quality. Should these not be available, then an English long wool crossed on the large-framed, plain bodied merino will be found satisfactory. The trouble with this type, however, is that if conditions are suitable for fattening lambs when they are on the ewe the temptation to sell them as lambs is too great. Well-grown crossbreds at five months can be sold usually to such advantage that it pays the man on good—and, therefore, expensive—country to sell them as lambs and buy ewes at the breeding age. Practically the only ewe at breeding age that is available in Queensland is the merino.

The only way out of the difficulty is for sheep farmers on suitable country further west to breed either pure-bred Corriedales or English long wool crosses, and sell the ewe progeny when about 2 tooth to the fat lamb raisers. The advantage of breeding to the pure-bred Corriedale is that only one breed is necessary; and, as they are suitable as a farmer's flock for both wool and mutton, they serve the dual purpose with the breeder, and the surplus ewes should meet with a good demand from fat lamb raisers. Much of the brigalow lands in the medium rainfall areas, when sufficiently developed and improved, can be used to advantage for sheep breeding, and the Corriedale is, it is considered, more suited to these areas than the merino.

—*J. Carew.*

Pigs Need Exercise.

Pigs kept continuously in sties or small runs spend most of their time sleeping or trying to get out of the enclosures. They are not given any chance of getting natural exercise, and when they go to the curer or pork butcher they fail to measure up to the full requirements of their class. Feeding and farm organisation may be perfect; large litter weights and early maturity may be the watchwords of management; and careful selection of breeding stock may be all that is desirable; but if the pigs have been denied opportunities for plenty of natural exercise they will be found to be unbalanced in fat and lean when they are cut up. Breeding, feeding, and open-air management are fundamentals in successful pig farming.

Rearing of Chickens.

The successful rearing of chickens is one of the most important points in poultry farming. Any setback which chickens receive, especially during the brooding stage, will be reflected in their development. Too much trouble cannot be taken to ensure that the chickens are reared under the most satisfactory conditions that circumstances will permit.

A reliable brooder is one of the first considerations—one that will generate sufficient warmth in the coldest weather to prevent the chickens packing together to get warm; and, at the same time, provide for plenty of fresh air. The brooder should be so constructed that the chickens can move away from the heat, if the temperature is too high, and get back again without any obstruction. Much of the wastage of chicken life could be avoided if due regard were paid to these fundamental factors in brooding.

The Best Type of Lamb for Export.

To meet the demands of both the home and the export trade, a true sucker lamb must be prime fat, irrespective of weight.

To produce the right lamb for export, at an age profitable to the grower, breeding is a prime essential. It follows naturally that different graziers have preferences for certain breeds of English sheep, but it may be laid down broadly that the best lamb for export is produced by a Downs sire—such as the Southdown or Dorset Horn—on ewes got by one of the long-woolled breeds—such as the Romney Marsh, Border Leicester, or Lincoln. The foundation merino ewe should be of a large-framed strong-woolled type. Corriedales make excellent breeders. Ewes in lamb should be maintained in good, strong condition, and no feed is too good for them.

From 30 to 33 lb. is the proper weight of a fat lamb, and this weight should be attained when it is about four months old.

"Don'ts" for Dairy Farmers.

Don't use cloths in the dairy—use brushes.

Don't leave skim milk about to go sour.

Don't leave utensils unscalded.

Don't fail to use boiling water to wash out the cloths used to wash the cows' teats and udders.

Don't put milk or cream in the cans which come back from the factory until they have been *scalded*, scrubbed with a brush, and aired.

Don't put a little night milk into the mornings can to fill it up.

Where milking machines are used, don't dip the tea cups in the water used to rinse the milk line—such water may spoil the milk and bring an inspector

Don't fail to examine the milk pipe line and see that the tinning is perfect.

Don't fail to inspect the corners and crevices of the milking machine.

Don't fail to wash the hands with a clean cloth and water.

Don't fail to study the physical condition of the herd. This is more important than one would think. Especially is this very marked in drought time. The cow has the natural mother instinct very firmly rooted. With the natural resources of the body reduced to a minimum the cow commences much earlier to store up nutriment for the time when the calf arrives. Consequently, an animal which in an ordinary good season would give good milk up to six weeks before calving, would, under dry conditions, commence to reduce her milk yield three months before. A sick cow in the herd will spoil all the product.

Don't fail to examine the water supply used for both drinking and washing-up purposes. An epidemic of "ropey" milk and cream from one district was found to be caused by the wells getting low. They were cleaned out and the trouble disappeared. Low dams or creek holes are likely to give trouble.

Don't wash up with anything but boiling water, and don't rinse the utensils after washing with anything but boiled water, unless very sure that the source is good.

Don't feed on scorched young corn or water-logged saccaline.

Don't keep the cream truck waiting, and don't let the truck keep you waiting. Early delivery to the factory ensures quick treatment. Late deliveries have to wait in the lorries in the heat and so deteriorate.

The roadside pick up should have a proper shelter, either built or thick foliaged trees. In the case of milk, one hour standing still is worse than two hours moving along.

KILL THOSE WORRYING TICKS
with
HARTON (Double Strength) **CATTLE DIP**

Harton Cattle Dip is the mildest obtainable, and is particularly recommended for its high wetting power.

Use it without fear of scalding—and remember, it is 100 per cent. soluble in any water.

Harton Cattle Dip (Double strength) was the first highly concentrated dip to be made in Queensland, and it is gazetted and registered under the Pest Destroyers Act

HIGHLY EFFECTIVE and ECONOMICAL

This table proves the economy of HARTON Cattle Dip

1 gallon Harton Dip will make 320 gallons dipping solution at a cost of 10/6; 4 gallons Harton Dip will make 1,280 gallons dipping solution at a cost of 42/-; 5 gallons Harton Dip will make 1,600 gallons dipping solution at a cost of 52/6.

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Many men have the impression that a Savings Bank Account is suitable only for women and children, and that it is neither convenient nor dignified enough for business men. Certainly those business men who have many payments to make over a considerable area need cheque accounts, but even those, in common with all other men, will find the Savings Account a most useful and convenient aid to money accumulation. There is nothing undignified in the transaction of Savings Bank business, but there is interest profit to be earned on such monies as would otherwise lie idle.

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SHELL WHITESPRAY gives perfect control of all types of scale on citrus and other fruit trees. Possessing unrivalled ovicidal properties, it is invaluable for controlling egg-laying insects — Codlin Moth, Aphis, Spider, etc. SHELL WHITESPRAY emulsifies readily with either soft or hard water. Spreads freely, completely covering all parts of the tree.

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for perfect control of SCALE . . .

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Orchard Notes

JANUARY.

THE COASTAL DISTRICTS.

ALL orchards and plantations should be carrying a good cover crop which will help to check erosion during the wet season and maintain the soil in good physical condition when cut and turned under.

Pineapple plantations should be kept well worked.

Pineapple growers who have missed the spring planting will usually find it better to delay activities until the end of February. The idea is to wait until the main monsoonal rains have ceased. Then the ground will still be warm and moist: while there still remains a sufficiently long growing period to enable young plants to become established before the cold weather checks growth.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Care is advised in the handling and marketing of all kinds of fruit.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends on the condition in which they reach the market. Well-coloured fruit, with the bloom on and without a blemish, always sells well.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe. A maturity standard for grapes is now in force, and immature grapes are liable to condemnation.

Bananas for the inter-State trade should be well filled but showing no sign of ripening. The fruit be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and despatched without delay..

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Granite Belt, and orchardists will be fully occupied gathering, packing, and marketing the crop of midseason fruits.

Much of the fruit may not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District; and, if they are carefuly selected and properly graded and packed, they should carry as far as Cairns.

Points to remember:—

The fruit must be fully developed, but yet quite firm when gathered.

It must be handled carefully. Bruised fruit is spoilt fruit.

Only one-sized fruit, of an even degree of ripeness and colour, should be packed in a case.

The fruit should be so packed that it will not shift, for if it is packed loosely it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

Farm Notes

JANUARY.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. If possible, do not allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghums *Setaria* Sp. (panicum), teosinte, and cowpeas. In some localities, potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as the weather is suitable. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed of varieties and quantities suitable to local conditions, is sown. The fact should be kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap' moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of voluteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and setaria. In favourable situations, both grain and saccharine sorghums may still be grown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing introduced grasses may be expected to lose some of their succulence in autumn and more of it in winter and early spring, the cropping "layout" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Saccaline, white African or planter's friend (sorghum) may be sown at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Land should be prepared also for winter-growing fodder crops.

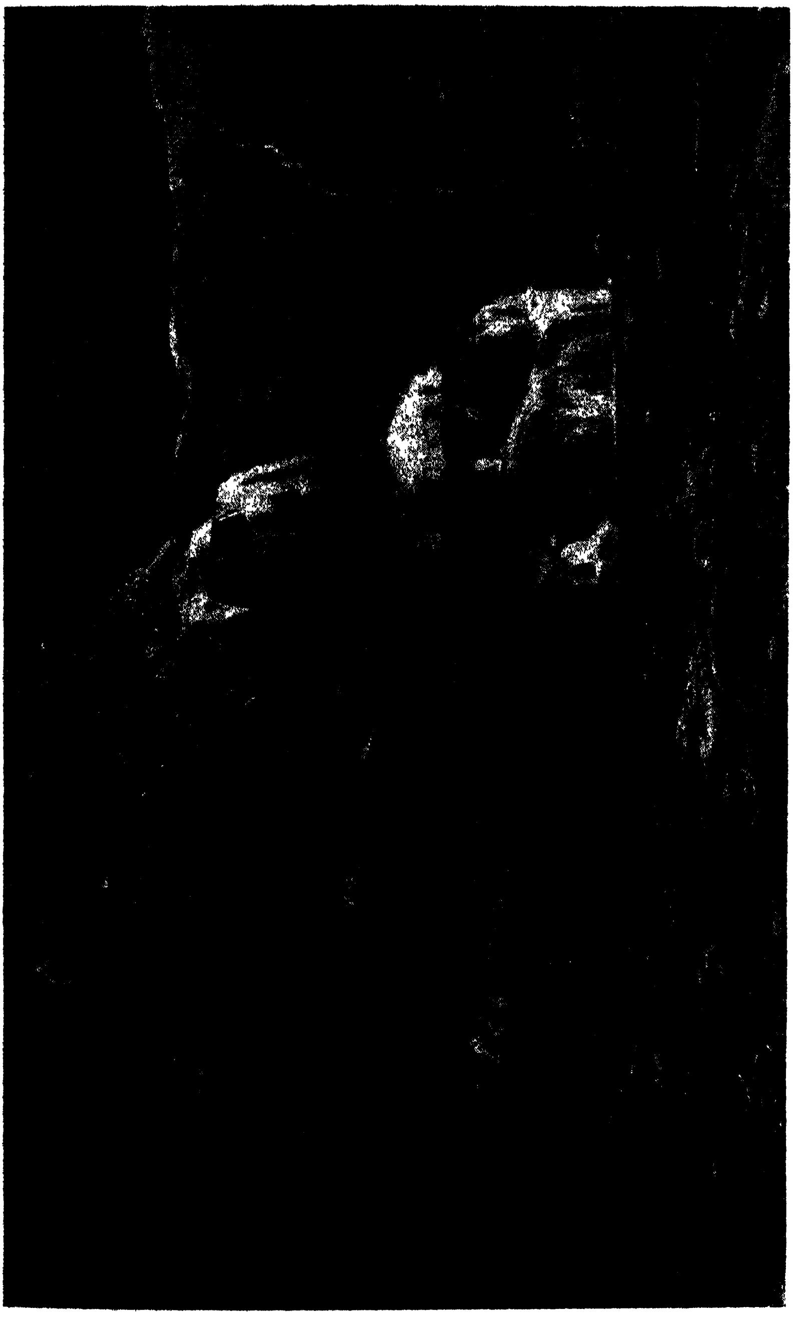

Plate 292.

Staghorn Falls, Yungaburra, Tableland, N.Q.

Plate 293. [*Photo. R. Lahey.*

NEAR WHERE THE LYRE BIRD BUILDS HER NEST—One of the numerous waterfalls in the Lamington National Park, Macpherson Range, South Queensland

OUR BABIES.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

PUNISHMENT: THE HOW AND THE WHY

THE following article is taken from the English journal, "Mother and Child," which is published by the National Council for Maternal and Child Welfare and its constituent societies:—

There is only one good reason for punishing a child—that is to make him understand that he must not repeat some action which you believe to be undesirable

Some parents punish their child for other reasons—perhaps because what the child is doing annoys them and they want him to stop; perhaps just to "pay him back" because he has been naughty; perhaps because the parents are tired and so get angry easily. None of these reasons are good ones. They are unfair to the child. To punish him for any of these reasons will not improve his conduct or make him more inclined to be good. They will only teach him to keep out of his parents' way when tempers appear to be short.

Is He Really Naughty?

Before you punish be quite sure that what your child is doing is really naughty. Are you sure that he is not just playing some game or perhaps even trying to help you?

It is not naughty for a child to be noisy. It is not naughty for him to want to move about. It is not naughty for him to want to touch and hold things. Children need to move about and make a noise. And it is by handling and feeling things that they learn what the world round about them is like. Of course, children do not need to be too noisy. They do not need to be rough. If they become too uproarious mother has to check them, but let her be very sure that their behaviour is unreasonable before she does so. Some children are naughty because they find it a sure way of getting mother's attention. If you have to punish your child again and again for doing the same thing, try different tactics. Praise him and give him lots of attention when he is good and pay no attention to him when he is naughty. Sometimes children are "whiny" and fretful simply because they are sleepy. The thing to do in such a case is not to slap them, but to see that they go to bed earlier, and that they have a nap in the afternoon.

Short tempers are often due to tiredness, even in the case of grown-ups, but mothers will agree that it is hardly fair to "take it out of" a child just because they are weary and irritable themselves. When people are tired they are irritated by little things that they would scarcely notice when their bodies and minds are rested. For example, one day baby may be playing with the saucepans in the kitchen earning everyone's approval for "helping mother." The next day he may do the same thing, to be rewarded with slaps for making such a noise, because mother happens to have a headache after a bout of washing. Now, is that fair to baby? Why was he slapped? Because he was naughty, or because mother was tired?

The wise mother will see to it that she has some rest each day. It will keep her from becoming overtired and help her to remain serene in dealing with her children.

Children Know What is Just.

Children are very keenly aware of justice and injustice. They know, for instance, that if they have been teasing their playmates it is fair for them to be made to play alone for a while. They know it is fair not to be given sweets when they have refused to eat their vegetables. They do not like these punishments, of course, but they do know they are fair.

Some punishments are much better than others. Smacking, scolding, locking a child in a room by himself, or forbidding him to play out of doors are not good ways of punishing, and the wise mother does not resort to them. She knows of much more effective ways of persuading her child to be good.

Perhaps her little boy has been bullying the children he plays with. She does not smack him or scold him, but she stops him from playing with them till he is ready to play nicely. If he forgets and renews his bad behaviour, then he must play alone again. Sooner or later he will learn that he must not hurt his playmates, because he wants to play with them; children do not like to be alone.

Another example—perhaps he does not come straight home from school or perhaps he does not come in when he is called. Mother does not say "To-morrow you cannot go out to play" because she knows he needs to be out in the fresh air and that it would be bad for him to go without play. Instead she deprives him of some small treat which it will not hurt him to go without.

Children who are naughty because they are tired do not need to be punished; they need to rest.

Some Golden Rules.

Pay no attention is a very useful rule for parents in a great many circumstances, particularly where temper, tantrums and fussiness about food are concerned.

The best plan of all, of course, is to keep your child from needing to be punished. This can be done if mother begins the task when he is a baby and bears in mind that she should:—

1. Pay attention to him when he is good and not only when he is naughty.

2. Always do what she promises.

3. Speak and act the truth to her child.

4. Never threaten a baby with punishments she cannot carry out.

5. Never laugh at or praise him for something one day, and scold or punish him for the same thing to-morrow.

6. Remember that a healthy child cannot sit still or be quiet all the time. Every child needs plenty of out-door play—running, jumping, and climbing.

7. Keep him so busy with interesting things to do that he has no time to be naughty.

If you do not like what your child is doing, give him something else to do; don't scold him. Remember that none of his toys are half so interesting to him as the everyday things of the home—the pots and pans, the vegetables you are peeling for dinner, the coal in the scuttle. He wants to find out all about them, and it is very desirable he should do so. Let him have the things he cannot break. Put away the things he should not have so that he won't see them. Then he will not ask for them, and you need not say no. Above all, do not try to make your child "good" by frightening him. Don't say, "If you're not good the policeman will come and take you away." Don't frighten him with dreadful things that the doctor or the dentist will do to him if he is naughty. You will make him afraid of people whom he should come to regard as friends—the policeman, who is someone who will always lead him safely across the road, the doctor or dentist, whom he should trust as kindly people who always want to make him feel well and better. Worse still, you will teach him not to trust you.

Do not use punishments to make him afraid of the dark. When he was a baby he was not afraid of the dark, but you will make him so if you lock him away in the dark when he is naughty.

All human beings, children included, have to learn that we all pay, in some way or other, for the bad things we do, but punishments must not be so severe that children will tell lies to escape it. Whipping children, slapping them and putting them in dark cupboards are punishments that make them afraid and cause them to tell lies. The untruthful child is generally the pitiful little child who has been made afraid.

Plate 294.

THE BEAUTY OF A WELL-KEPT HEDGE.—In these terraced grounds, dry-stone walls are covered with a dense growth of Rhincospermum—the glory of the garden when in scented bloom.

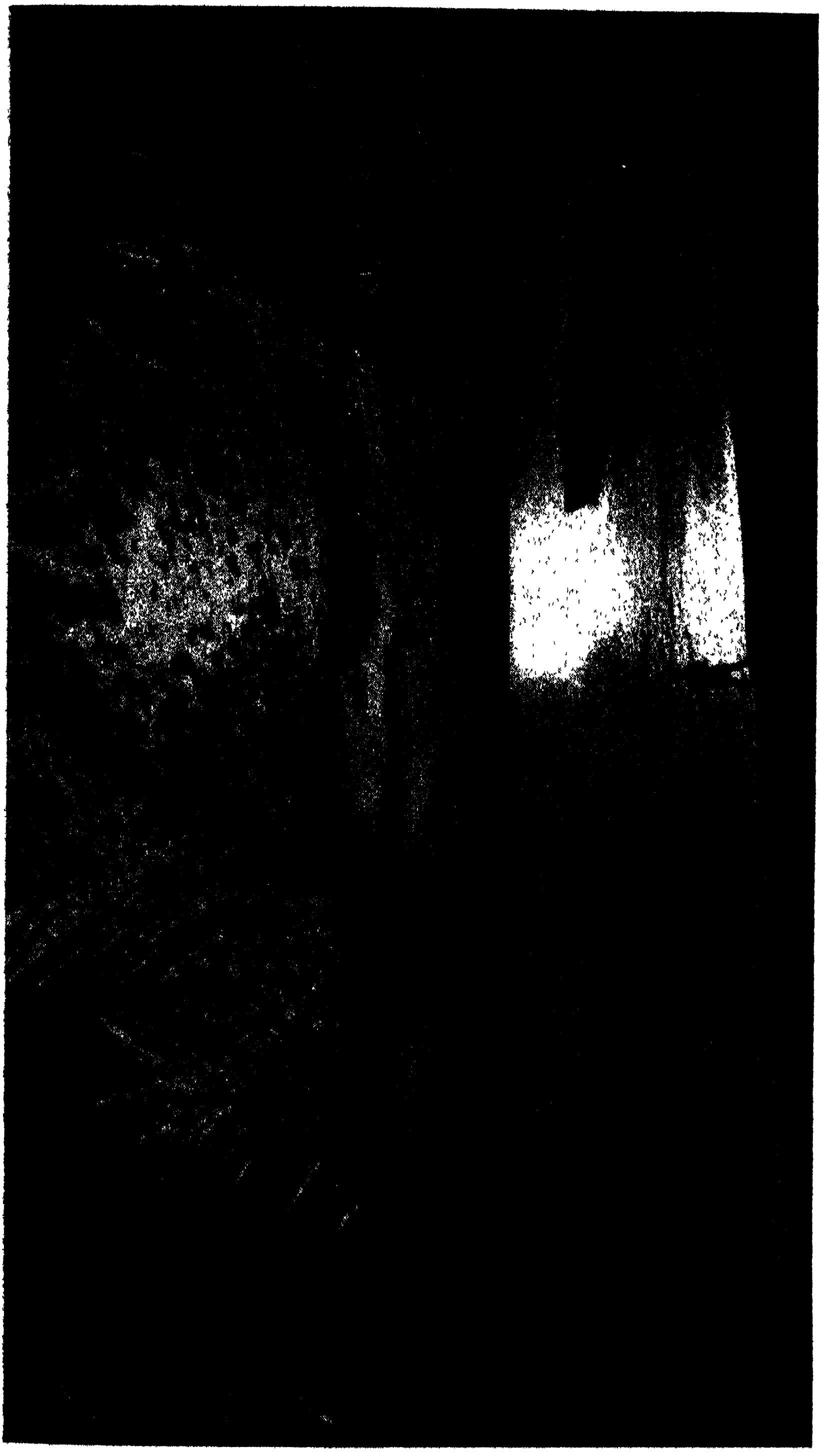

Plate 295.

Sunset at Palm Island, North Queensland.

IN THE FARM KITCHEN.

CHRISTMAS PUDDINGS AND SAUCES.

Christmas Pudding.

Take ½ lb. suet, ½ lb. raisins, ¼ lb. flour, ¼ lb. currants, ¼ lb. peel, ¼ lb. sultanas, 1 oz. almonds, grated rind ½ lemon, 2 tablespoonfuls golden syrup, 2 eggs, ½ gill milk, ¼ nutmeg (grated).

Prepare the fruits. Chop the suet. Mix the flour and suet together. Add the lemon rind, nutmeg, and prepared fruits. Cut the peel into small pieces, blanch the almonds and cut into pieces. Add these to the other ingredients and mix well. Whisk up the eggs, add the golden syrup, and whisk together. Put into a greased basin, cover with greased paper and floured pudding cloth. Put into a saucepan of boiling water and steam for eight hours. Turn on to a hot dish and serve.

Children's Christmas Pudding.

Take ¾ lb. grated beef suet, 1 lb. breadcrumbs, ¼ lb. fine flour, ¾ lb. raisins (stoned and chopped), ¼ lb. sultanas, grated rind and juice 2 oranges, ½ teaspoonful salt, 4 eggs, ½ lb. golden syrup, ½ pint milk.

Mix the dry ingredients first, warm the syrup, and mix with the beaten eggs and milk, add the strained orange juice; then work the whole into a stiff paste very thoroughly. Keep over for two days, mix again, then put into two well-greased moulds, tie down securely, and boil for four hours. Boil for another hour when going to use the puddings. A few blanched and split almonds should decorate the puddings when turned out of the moulds.

Plum Pudding.

Take 1 lb. currants, 1 lb. sultanas, 1 lb. sugar, ¾ lb. finely-chopped suet, ½ lb. flour, ½ lb. breadcrumbs, 1 lb. raw carrots (finely grated), 3 oz. candied peel, 1 oz. salt, 2 eggs, 1 grated nutmeg, ginger and cinnamon to taste.

Put all the dry ingredients into a large mixing basin. Cut up the candied peel very finely. Mix all well together and add the well-beaten eggs. Make the pudding two weeks before wanted, and steam it for six hours. Hang it up in the cloth in which it was boiled until it is required, when boil again for one or two hours. No milk or other moisture is required in mixing this pudding.

Rich Christmas Pudding.

Take 1 lb. finely-chopped suet, 1 lb. brown sugar, 1 lb. stoned raisins, 1 lb. currants, ¼ lb. candied peel (cut in thin slices), ½ lb. flour, 8 oz. breadcrumbs, 8 eggs, 3 oz. almonds (blanched and shredded), 1 saltspoonful grated nutmeg, 2 teaspoonfuls baking powder, grated rind of 1½ lemons, 1 teaspoonful salt, about ½ pint milk, 1 gill brandy.

Thoroughly mix together all the dry ingredients, then stir in the eggs, which have been well beaten; add gradually the milk and, lastly, the brandy. This quantity will make four good-sized puddings. Place in buttered moulds or basins, and steam for five hours. When needed for table, steam another two hours. Serve with any sauce which is preferred.

Christmas Pudding.

Take 3 oz. flour, 6 oz. suet, 3 oz. breadcrumbs, 6 oz. stoned raisins, 6 oz. currants, 4 oz. minced apple, 3 eggs, 5 oz. sugar, 2 oz. candied peel, ½ teaspoonful spice, 1 small wineglassful brandy, pinch of salt, ½ teaspoonful nutmeg.

Mix together the flour, breadcrumbs, chopped suet, raisins, currants, minced apples, sugar, peel (minced small), nutmeg, spice, a pinch of salt, the brandy and whole eggs. Mix and beat these ingredients well together, pour them into a well-buttered mould or basin, spread a buttered paper over, then tie a cloth firmly over the top. Boil for four hours, keeping the pudding well covered with boiling water, then turn it out, sift icing sugar thickly over the top, pour two or three tablespoonfuls of brandy round, and, just before serving, set it alight. This pudding may be served with wine or punch sauce, or with rum or brandy butter.

Individual Christmas Puddings.

Take 4 oz. suet, ½ lb. raisins, ¼ lb. currants, 2 oz. sultanas, 2 oz. candied peel, 1 oz. shelled walnuts, 4 oz. sugar, 3 oz. breadcrumbs, 1½ oz. flour, grating of nutmeg, ¼ flat teaspoonful ground cloves, 2 eggs, ½ gill rum.

Wash, pick over, and dry the fruits and stone the raisins. Shred the candied peel and chop up the walnuts. Sieve the flour with the spices, add the finely-chopped suet, and the breadcrumbs, then stir in the sugar, prepared fruits and nuts, and mix all together. Whisk the eggs and add them. Moisten the mixture with the rum and some milk as required. Beat it well and leave it to stand overnight, adding more moisture after that time, if necessary. Turn the mixture into six buttered moulds. Cover them securely with buttered papers and steam them for about an hour and a half or two hours. Unmould the puddings and serve them with half a shelled walnut on each.

Christmas Pudding.

Take ½ lb. breadcrumbs, ½ lb. raisins, 1 oz. citron peel, 1 grated carrot, ½ lb. brown sugar, ½ lb. muscatel raisins, ½ lb. shredded suet, 2 oz. lemon peel, 6 eggs, 2 nutmegs, ½ lb. currants, ¼ lb. orange peel, 3 oz. almonds, 6 oz. flour, 1½ gills ale, salt.

Mix the breadcrumbs, sugar, grated nutmeg, chopped raisins, cleaned currants, minced peels, and a pinch of salt together in a basin. Stir in the suet, then the blanched almonds. Add well-beaten eggs and remaining ingredients, without the ale. Beat for two or three minutes with a wooden spoon, then stir in the ale, cover, and leave for several days, stirring once daily. Pack into two buttered basins. Cover with buttered paper, then a floured cloth. Steam for seven or eight hours in a saucepan with boiling water coming half way up the sides. When required, cook for three hours, then turn out, sprinkle with vanilla sugar, decorate with a sprig of holly, and serve with brandy or rum custard.

Economical Christmas Pudding.

Take ½ lb. beef suet, ¼ lb. flour, ¼ lb. breadcrumbs, 6 oz. cleaned currants, 6 oz. stoned raisins, ¼ lb. brown sugar, ¼ lb. cooked carrot, ¼ lb. cooked potato, 2 oz. candied peel (finely shredded), 1 teaspoonful salt, 2 tablespoonfuls brown treacle.

Rub the carrot and potato through a sieve. Mix together all the dry ingredients with the sieved carrot and potato, and this will require time, as it is not easy to mix them well without moisture. Last of all stir in the treacle, after warming it until it runs. Mix very thoroughly, and keep in the mixing basin several days, stirring the pudding every day. Then put into a large basin (well greased), cover with greased paper and thick dry paper over all, and steam for six hours. When re-heating, allow two hours for steaming through. Serve with brandy sauce or custard.

Almond Sauce.

Take ¼ lb. ground almonds, 2 oz. castor sugar, 1 whole egg and 3 yolks, ¼ pint cream, ¼ pint milk, 1 wineglassful brandy, ½ teaspoonful essence of bitter almonds.

Pound the almonds and sugar together in a basin, and add the egg and egg-yolks (well beaten), then milk and cream by degrees. Turn into a jug, place this in a saucepan of hot water, and stir till the mixture thickens, which will take quite a quarter of an hour. Remove from the heat and continue stirring at intervals till nearly cold, add brandy and essence, and heat again in the saucepan before serving.

Brandy Sauce.

Take 2 oz. butter, 2 oz. flour, ½ pint milk, pinch of salt, sugar, brandy.

Dissolve the butter, and work into it the flour until perfectly smooth; then dilute with the milk, slightly warmed. Add the salt, and bring to the boil, stirring all the time. Boil for two minutes, then add a little thick cream or another pat of cold butter. Pour a wineglass of brandy over six lumps of sugar; when dissolved, stir into sauce, which should not boil again.

Punch Sauce.

Take 2 oz. sugar, 1 oz. butter, 1 teaspoonful rice flour, ½ wineglassful rum, ½ wineglassful marsala, ½ wineglassful brandy, lemon, orange, 1 gill water.

Put the sugar on to boil with the water, the rind of half a small lemon (pared very thinly), and a rather smaller quantity of orange-peel. Let them simmer for fifteen minutes, then take out the peel. Mix the rice flour quite smoothly with a little cold water, and stir into the boiling syrup. Add the butter in small pieces, then the strained juice of half the orange, also a teaspoonful of the lemon juice. Boil for ten minutes, then add the rum, marsala, and brandy, but do not let the sauce boil after they are added.

Hard Sauce.

Take 4 level tablespoonfuls of butter, 2 level tablespoonfuls castor sugar, 4 teaspoonfuls brandy, pinch of grated nutmeg.

Beat the butter to a cream, beat in the sugar, then the brandy and nutmeg. Heap the mixture in a glass dish, and put it on ice or in a cold place until required.

SUMMER FRUIT DRINKS.

Nothing is more refreshing or pleasing in warm weather than a well-prepared fruit drink, while from a health point of view the habit of drinking fruit juices needs no stressing. Their wholesomeness may be particularly emphasised as beverages for children, who, left to their own devices, are quick to acquire the taste for them. Many so-called orange and lemon drinks contain no fresh fruit at all, but are made from chemicals and artificial colouring matter. Not only do they not have the food value that the real fruit possesses, but they may be definitely injurious to the child's health.

The only drinks of this kind that the child should be permitted to have should be made from the fresh fruit juice. Mothers who make real fruit juice drinks for their children will not be teased for artificial soda and other harmful drinks. Fruit juices not only satisfy thirst; the natural fruit acids they contain supply beneficial elements to the child's diet.

Pineapple Drink.—Wash the skin of pineapple. Place in a lined saucepan with the core and enough cold water to cover. Cook slowly three-quarters of an hour. Add 3 tablespoons or more sugar and the juice of 1 orange or lemon. Strain and allow to cool. Chill and serve.

Fruit Punch.—Take ½ cup lemon juice, 1 cup orange juice, grated rind ½ orange, 1 tablespoon grated lemond rind, 1 quart water, 3 or 4 cups of sugar. Cook water and sugar for 3 minutes, cool and mix with orange and lemond juice, rind, &c. To this add the following ingredients:—(1) 1 quart ginger ale, ¼ cup preserved ginger cut up finely, (2) 1 cup grated pineapple, 1 pint soda water.

Fruit Cup.—Take 2 lemons, 1 quart boiling water, 2 oranges, 4 passion-fruit, 1 ripe pear (if available), 4 tablespoons sugar, few drops cochineal. Wash lemons, peel thinly into a large jug or bowl; squeeze juice and place it in jug with rind and sugar; pour the boiling water over this and cover till cold. Strain into glass jug, colour very pale pink, add slices or oranges, passion-fruit pulp, and cut pear or other fruit. Place in ice chest and serve very cold.

PASTEURISATION.

The object of pasteurisation is, firstly, to make milk and milk products safe, by destroying any disease germs that may be present; and, secondly, to improve the keeping quality of butter and cheese made from milk and cream so treated. Pasteurisation, however, has its limitations. It cannot perform miracles—such as improving the grade of cream from second to choice, or eliminating strong weed taints.

Most dairy farmers are aware of this, and know that the production of choice quality cream depends on the care and attention given on the farm, and that the pasteurisation process is beneficial in that a butter of choice quality can be manufactured to withstand long periods of cold storage.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON

Divisions and stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1937.	Oct. 1936.
[illegible]h Coast.	In.		In.	In.
Atherton	0·94	36	0·21	0·71
Cairns	2·18	55	0·03	0·16
Cardwell	2·05	65	0·28	0·18
Cooktown ..	1·03	61	0·75	0·15
Herberton ..	0·99	51	0·14	0·87
Ingham	1·90	45	0·02	0·05
Innisfail	3·27	56	0·55	0·19
Mossman Mill ..	3 02	24	0·18	0·11
Townsville ..	1·33	66	0·90	..
Central Coast.				
Ayr	0·92	50	0·22	..
Bowen	1·01	66	1·13	..
Charters Towers ..	0·72	55	0·67	0·03
Mackay	1·71	66	2·29	2·09
Prosperine ..	1·60	34	2 05	0·15
St. Lawrence ..	1·77	66	3·63	0·56
South Coast.				
Biggenden ..	2·40	38	4·52	0·61
Bundaberg ..	2·09	54	3·64	0·93
Brisbane	2·54	85	3·59	0·16
Caboolture ..	2·50	50	7·16	0·51
Childers	2·69	42	5·46	1·32
Crohamhurst ..	3·27	44	5·06	1·53
Esk	2·49	50	10·13	0·22
Gayndah	2·39	66	3·69	1·62
Gympie	2·70	67	4·95	0·92
Kilkivan	2·61	58	4·80	2·34
Maryborough ..	2·76	66	1·81	1·10
Nambour	3·07	41	8·76	1·05
Nanango	2·25	55	2·47	0·72
Rockhampton ..	1·77	66	2·27	0·86
Woodford	2·54	50	7·32	0·42
Central Highlands	In.		In.	In.
Clermont ..	1·31	66	0 32	0·32
Gindie	1·37	38	..	..
Springsure ..	1·64	68	1·06	0·32
Darling Downs				
Dalby	2·04	67	3·41	0·50
Emu Vale .	2·17	41	2·89	0·53
Hermitage ..	1·86	31	..	0·34
Jimbour ..	1·87	49	1·50	0·75
Miles	2·02	52	2·11	0·28
Stanthorpe ..	2·53	64	1·72	0·73
Toowoomba ..	2·54	65	4·70	0·25
Warwick ..	2·29	72	3 81	0·47
Maranoa.				
Roma	1·76	63	0 96	0·36
State Farms, &c				
Bungeworgorai ..	1·50	22	..	..
Gatton College .	1·96	38	5·37	0·15
Kairi . .	1·02	21	..	..
Mackay Sugar Experiment Station	1·47	40	1·54	2·47

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—OCTOBER, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure. at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Day .
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·95	84	73	97	21	60	22	75	2
Herberton	..	82	56	89	30	45	22	14	2
Rockhampton	30·01	89	65	97	25	57	20	227	3
Brisbane	30·02	82	63	99	24	58	14	359	9
Darling Downs.									
Dalby	30·01	83	56	97	25, 26	44	19, 3	341	7
Stanthorpe	..	76	49	91	26	37	3, 19	172	8
Toowoomba	..	77	54	92	24	44	3	470	8
Mid-Interior.									
Georgetown	29·94	96	65	102	25, 27	49	20	5	1
Longreach	29·94	96	63	107	26, 27	49	19	6	1
Mitchell	29·98	88	54	103	26	42	2	79	2
Western.									
Burketown	29·94	93	69	100	12	58	20	Nil	..
Boulia	29·90	96	63	107	26	50	17	Nil	..
Thargomindah	29·95	89	62	105	23	50	1, 17	Nil	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December. 1937.		January. 1938.		MOONRISE.	
					Dec. 1937.	Jan. 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	4·49	6·31	5 1	6·50	3·19	4·19
2	4 49	6·32	5·2	6·50	4·0	5·9
3	4·49	6·33	5·2	6·50	4·44	6·5
4	4·50	6·34	5·3	6 51	5·32	6·59
5	4·50	6 35	5·3	6·51	6·22	7·51
6	4·50	6·36	5·4	6·51	7·16	8·46
7	4·50	6·37	5·5	6·51	8·9	9·41
8	4·50	6 38	5·5	6·52	9·3	10·36
9	4·51	6·38	5·6	6·52	9·57	11·33
						p.m.
10	4·51	6·39	5 7	6·52	10·48	12·23
11	4·51	6·39	5·8	6·52	11·48	1·36
					p.m.	
12	4·51	6·40	5·9	6 51	12·44	2·43
13	4·52	6·40	5·9	6 51	1·45	3·48
14	4·52	6·41	5·10	6·51	2·49	4 51
15	4·52	6·41	5 11	6·51	3·55	5·51
16	4·52	6·42	5·12	6 50	5·4	6·41
17	4·53	6·42	5·13	6·50	6·8	7 27
18	4·53	6·43	5·13	6·50	7·9	8·9
19	4·53	6·43	5·14	6·50	8·7	8·49
20	4·54	6 44	5·15	6·50	8·55	9·29
21	4·54	6 44	5·16	6·49	9·40	10·5
22	4·55	6·45	5·17	6·49	10·18	10·47
23	4·55	6 45	5·18	6·49	10·56	11·18
24	4·56	6·46	5·19	6·49	11·39	11·58
25	4·56	6·46	5·19	6·48	. .	. .
					a.m.	a.m.
26	4·57	6·47	5·20	6·48	12·4	12·39
27	4 58	6 48	5·21	6·48	12·42	1·24
28	4·58	6·48	5·22	6 48	1·19	2·13
29	4·59	6·49	5·23	6·47	2·0	3·4
30	4·59	6 49	5·24	6·47	2·42	3·57
31	5·0	6·50	5·25	6·47	3·28	4·52

Phases of the Moon, Occultations, &c.

3rd Dec. ● New Moon 9 11 a.m.
11th „ ☽ First Quarter 11 12 a.m.
19th „ ○ Full Moon 4 52 a.m.
25th „ ☾ Last Quarter 12 20 a.m.

Apogee, 4th December, at 8 a.m.
Perigee, 17th December, at midnight.
Apogee, 31st December, at 4 a.m.

Mercury rises at 5.54 a.m., 1 hour 5 minutes after the Sun, and sets at 7.36 p.m., 1 hour 5 minutes after it, on the 1st; on the 15th it rises at 6.19 a.m., 1 hour 27 minutes after the Sun, and sets at 8.12 p.m., 1 hour 31 minutes after it.

Venus rises at 3.54 a.m., 55 minutes before the Sun, and sets at 5.18 p.m., 1 hour 13 minutes before it, on the 1st; on the 15th it rises at 4.2 a.m., 50 minutes before the Sun, and sets at 5.45 p.m., 56 minutes before it.

Mars rises at 9.23 a.m. and sets at 11.21 p.m. on the 1st; on the 15th it rises at 9.33 a.m. and sets at 10.44 p.m.

Jupiter rises at 8.14 a.m. and sets at 9.56 p.m. on the 1st; on the 15th it rises at 7.34 a.m. and sets at 9.13 p.m.

Saturn rises at 1.1 p.m. and sets at 1.21 a.m. on the 1st; on the 15th it rises at 12.8 p.m. and sets at 12.25 a.m.

On the 22nd, the day of our summer solstice, the Sun will be directly overhead at midday at all places 23½ deg. south of the celestial equator, and its vertical rays will make themselves felt more or less uncomfortably "We go in a circle by night, that we may not be consumed by fire" (a saying from the Latin, its origin unknown). Asked for an explanation, Mr. Eglinton answered that were there no circular movement around the earth's axis unmitigated heat would soon consume us. But in Spitzbergen at midsummer there is sunshine day and night—on account of the tilt of the earth's axis—and the "dazzling Sun" was seen there at midnight last June "over the silver birches and a range of low hills"; but a Finnish author said of such a night: "The whole nature is beaming, all is so soft, so clear, the most common objects are enveloped in an enchanting light. . . . "

In our hemisphere the finest of the northern constellations are now coming into view, rising a little earlier night by night. On Christmas Eve and later, when the Moon has waned, the Pleiades, the Hyades, Orion, and Canis Major, with Sirius, will form a brilliant curve in the north-east, while the great ship Argo, with Canopus, stretches full length from the Southern Cross to Canis Major, east of the zenith.

2nd Jan. ● New Moon 4 58 a.m.
10th „ ☽ First Quarter 12 13 a.m.
16th „ ○ Full Moon 3 53 p.m.
23rd „ ☾ Last Quarter 6 9 p.m.

Perigee, 15th January, at 12 noon
Apogee, 27th January, at 4.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oonteo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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